SONOMA COUNTY WATER AGENCY

MEMORANDUM

FILE:PROJ/SVCSD TERTIARY TREATMENT
UPGRADE PROJECT 70-12-7 #30

DATE: **JUNE 8, 2006**

TO: **PLANHOLDERS**

FROM: **DALE ROBERTS, PROJECT MANAGER**

SUBJECT: **SONOMA VALLEY COUNTY SANITATION DISTRICT (SVCSD) TERTIARY TREATMENT UPGRADE PROJECT - SUBSTITUTION REQUEST FOR KRUGER HYDROTECH DISCFILTER TERTIARY FILTER**

Attached are the completed Document 00660 (Substitution Request Form) for the subject substitution request and the Owner's remarks to the request.

SONOMA VALLEY COUNTY SANITATION DISTRICT (SVCSD)
TERTIARY TREATMENT UPGRADE PROJECT
REMARKS TO SUBSTITUTION REQUEST FORM FOR
KRUGER HYDROTECH DISCFILTER TERTIARY FILTER

FILE:PROJ/SVCSD TERTIARY TREATMENT
UPGRADE PROJECT 70-12-7 #30

SVCSD has reviewed the Substitution Request submitted by I. Kruger, Inc. for Hydrotech Discfilter as acceptable equipment under Section 11212 – Tertiary Filters (Option C). SVCSD has determined that the Hydrotech Discfilter is accepted as noted below.

1. Tertiary filtration system shall meet requirements of Section 11212 and maintain the same operational functionality as Tertiary Filter (Option A) and Tertiary Filter (Option B). Operational functionality of these tertiary filtration systems includes but is not limited to the following:
   a. Continuous metering of backwash return;
   b. Ability to isolate each filtration cell and recirculate a chemical solution through or across the filter media of the isolated cell while all other filtration cells remain in service.
2. Four Discfilter Model HSF2216-2F tertiary filters (three duty, one standby) must be provided.
3. As per paragraph 11212-1.4.A, Contractor must provide revised design drawings for all drawings pertaining to the tertiary filtration system during submittal review. Owner will furnish to the Contractor all AutoCAD drawings used to prepare the Bid Documents. At a minimum, the drawings (whether designated "A" or "B") requiring revision would be: G-4, C-3, C-4, C-5, C-6, C-7, C-11, SP-4, SP-5, SP-6, SP-7, SP-8, SP-9, SP-10, SP-11, SP-16, E-3, E-4, E-5, E-6, and E-9.

DOCUMENT 00660

SUBSTITUTION REQUEST FORM

During Bid Period To:	After Award of Contract To:
Dale Roberts, P.E. Sonoma Valley County Sanitation District Fax: 707-524-3782	Mathew Vail, Construction Management Sonoma Valley County Sanitation District Fax: 707-524-3791

Project: Tertiary Treatment Plant Upgrade

Bidder: N/A

Subcontractor/Supplier: Kruger

Drawing Sheet Reference/Detail No: Alternative B Drawings

The undersigned Bidder submits for consideration the following equipment instead of the specified item for the above Project:

Section	Paragraph	Specified Item
11212	All	Alternative Filtration System

Proposed Substitution: Hydrotech Discfilter

The undersigned encloses the information required herein. If this Document 00660 is being submitted by a Bidder wishing to use "equal" item(s) as provided in Document 00200 (Instructions to Bidders), the undersigned Bidder must also enclose the technical information (other than cost) otherwise required for a post-Award of Contract Request for Substitution ("RFS") under Section 01600 (Product Requirements). However, if this Document 00660 is being submitted under provisions of Contract Documents after Award of Contract, the undersigned Contractor must include all information required under Section 01600 (Product Requirements).

The undersigned has (a) attached manufacturer's literature, including complete technical data and laboratory test results, if applicable, (b) attached an explanation of why proposed substitution is a true equivalent to specified item, (c) included complete information on changes to Contract Documents that the proposed substitution will require for its proper installation, and (d) filled in the blanks below:

A. Does the substitution affect dimensions shown on Drawings? (If yes, please explain)

Yes. See attached information package.

B. Are the manufacturer's guarantees and warranties on the proposed substitution items identical to those on the specified items? If there are differences, please specify each and every difference in detail.

Yes

C. What effect does the substitution have on other contractors, trades, or suppliers?

None

D. What are the differences between the proposed substitution and the specified item? If proposed substitution has a color or pattern, provide a color board showing proposed substitution in relation to the other adjacent colors and patterns.

Yes. See attached information package per Section 01600.

E. Will granting the requested substitution cause any schedule delay? (If yes, please explain)

None

The undersigned Bidder certifies that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item.

Submitted by:

I. KRUGER INC.
Bidder

M. D Hathaway
Signature

M. TODD HATHAWAY
Name

401 HARRISON OAKS BLVD SUITE 100
Address

CARY, NC 27513
City/State/Zip

Telephone: 919.677-8310

Date: 5/25/06

For Use by Owner:

___ Accepted X Accepted as Noted

___ Not Accepted ___ Received Too Late

By: [signature]
Owner's Representative

Date: 06 JUNE 2006

Remarks: SEE ATTACHED MEMO.

END OF DOCUMENT

Krüger

401 Harrison Oaks Blvd
Suite 100
Cary, NC 27513
Phone (919) 677-8310
Fax (919) 677-0082

Fax

Location: I. Kruger Inc. **Pages 1 of** MANY

Date: 5/25/06

To: MR. DALE ROBERTS, P.E. **Company:** SONOMA VALLEY COUNTY SANITATION DISTRICT

Fax: 707-524-3782 **Tel:**

From: TODD HATHAWAY

C.C.: FILE

Subject: SVCSD TERTIARY TREATMENT PLANT UPGRADE
KRUGER DISCRETION SUBSTITUTION REQUEST INFORMATION.

MR. ROBERTS,

I APOLOGIZE FOR THE DELAY AND THE MANNER IN WHICH I AM SUBMITTING THIS INFORMATION. KRUGER DID NOT RECEIVE THE BIDDING DOCUMENTS UNTIL TODAY. I AM FAXING YOU A HARD COPY PACKAGE (AS LISTED ON FORM 00660). I WILL ALSO OVERNIGHT YOU A COPY FOR YOUR RECORDS. PLEASE CALL WITH QUESTIONS.

THANK YOU!

M. J. Hathaway

PRODUCT MANAGER

VEOLIA Water

SVCSD TERTIARY TREATMENT PLANT UPGRADE

SUBSTITUTION REQUEST PACKAGE

SVCSD TERTIARY TREATMENT PLANT UPGRADE
SUBSTITUTION REQUEST

TABLE OF CONTENTS
(Per Section 01600 – 1.3.D)

A. DOCUMENT 00660 – SUBMISSION REQUEST FORM

DOCUMENT 00660

SUBSTITUTION REQUEST FORM

During Bid Period To:	After Award of Contract To:
Dale Roberts, P.E. Sonoma Valley County Sanitation District Fax: 707-524-3782	Mathew Vail, Construction Management Sonoma Valley County Sanitation District Fax: 707-524-3791

Project: Tertiary Treatment Plant Upgrade

Bidder: N/A

Subcontractor/Supplier: Kruger

Drawing Sheet Reference/Detail No: Alternative B Drawings

The undersigned Bidder submits for consideration the following equipment instead of the specified item for the above Project:

Section	Paragraph	Specified Item
11212	All	Alternative Filtration System

Proposed Substitution: Hydrotech Discfilter

The undersigned encloses the information required herein. If this Document 00660 is being submitted by a Bidder wishing to use "equal" item(s) as provided in Document 00200 (Instructions to Bidders), the undersigned Bidder must also enclose the technical information (other than cost) otherwise required for a post-Award of Contract Request for Substitution ("RFS") under Section 01600 (Product Requirements). However, if this Document 00660 is being submitted under provisions of Contract Documents after Award of Contract, the undersigned Contractor must include all information required under Section 01600 (Product Requirements).

The undersigned has (a) attached manufacturer's literature, including complete technical data and laboratory test results, if applicable, (b) attached an explanation of why proposed substitution is a true equivalent to specified item, (c) included complete information on changes to Contract Documents that the proposed substitution will require for its proper installation, and (d) filled in the blanks below:

A. Does the substitution affect dimensions shown on Drawings? (If yes, please explain)

Yes. See attached information package.

B. Are the manufacturer's guarantees and warranties on the proposed substitution items identical to those on the specified items? If there are differences, please specify each and every difference in detail.

Yes

C. What effect does the substitution have on other contractors, trades, or suppliers?

None

D. What are the differences between the proposed substitution and the specified item? If proposed substitution has a color or pattern, provide a color board showing proposed substitution in relation to the other adjacent colors and patterns.

Yes. See attached information package per Section 01600.

E. Will granting the requested substitution cause any schedule delay? (If yes, please explain)

None

The undersigned Bidder certifies that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item.

Submitted by:

I. KRUGER INC.
Bidder

M. D. Hunt
Signature

M. TODD HATHAWAY
Name

401 HARRISON OAKS BLVD. SUITE 100
Address

CARY, NC 27513
City/State/Zip

Telephone: 919-677-8310

Date: 5/25/06

For Use by Owner:

___ Accepted _____Accepted as Noted

___ Not Accepted _____Received Too Late

By: _____
Owner's Representative

Date: _____

Remarks: _____

END OF DOCUMENT

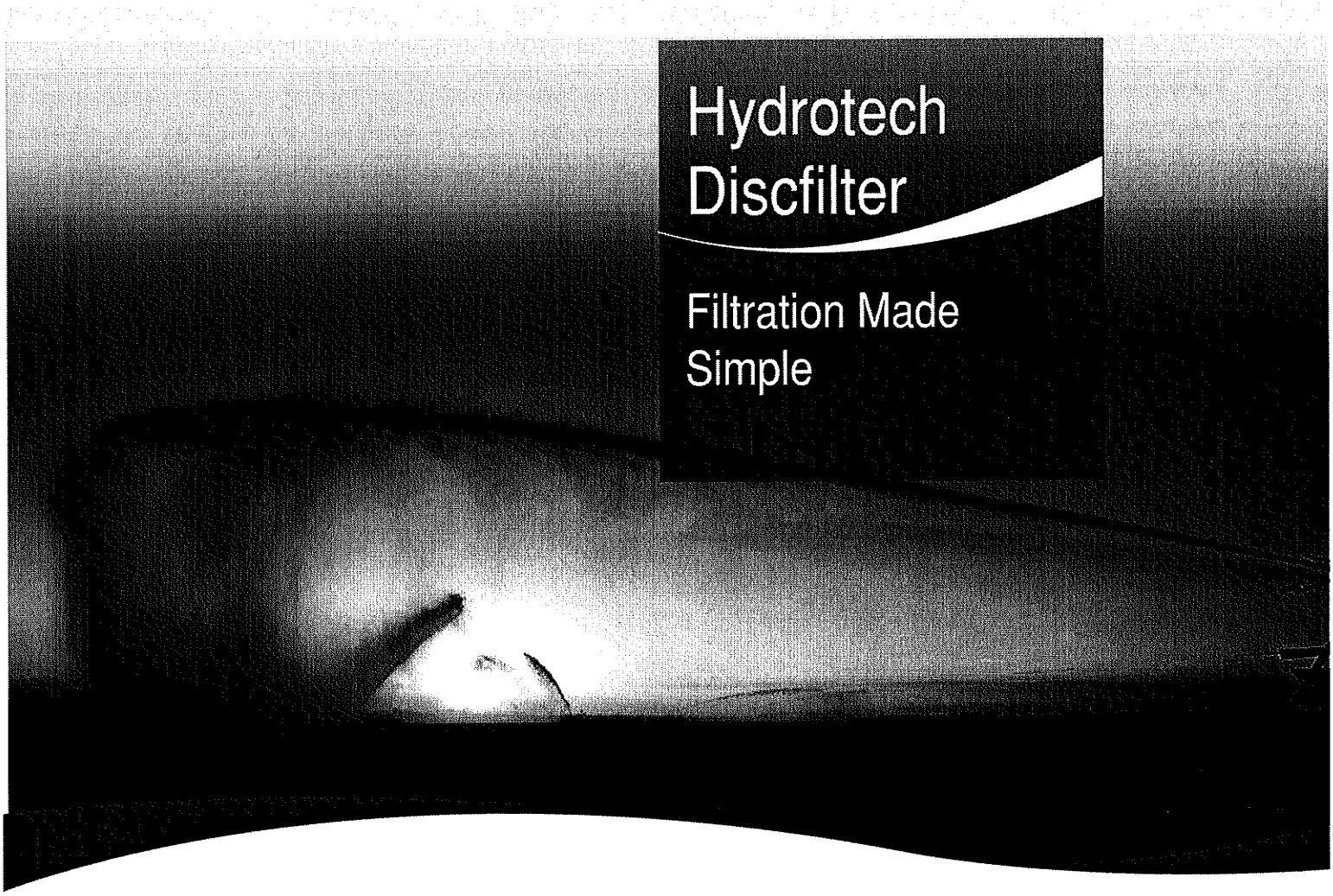
B. PRODUCT IDENTIFICATION

HYDROTECH DISCFILTER

Number of Discfilter units:	4 (3 duty, 1 standby)
Discfilter Model:	HSF2216-2F
***Drum*:**	
Material	SS304
Disc:	
Material	ABS
***Filter element*:**	
Frame material	SS304
Filter media	Woven Polyester
Filter pore size, µm	10
Number of discs installed per unit	16
Total filter area, ft^2	964
Submerged filter area, ft^2	627
***Drive system*:**	
Gearbox and motor manufacturer	SEW Eurodrive
Filter motor	1.5 hp, 480V, 3-phase, 60Hz
***Back-wash pump*:**	
Rinse water pump type	Grundfos
Pump motor	15 hp, 480V, 3-phase, 60Hz
Capacity at 110 psi	106 gpm
***Covers*:**	
Material	Aluminum
***Tank*:**	
Material	Concrete basins (provided by others)

C. MANUFACTURER'S LITERATURE

Krüger



Hydrotech Discfilter

Filtration Made Simple

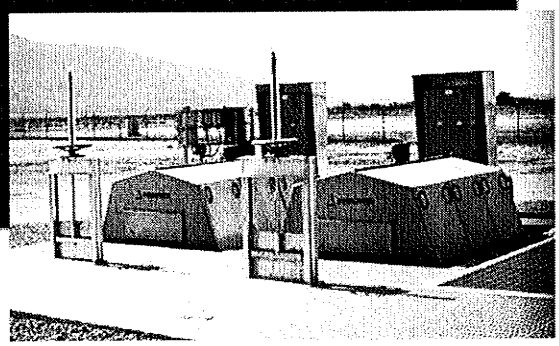
VEOLIA WATER

Solutions & Technologies

Hydrotech Discfilter

THE STURDY AND COMPACT TITLE 22 APPROVED HYDROTECH DISCFILTER IS A GREAT CHOICE FOR:

- Effluent Polishing of Wastewater
- Water Reclamation and Reuse
- Product Recovery
- Process Water Filtration
- Other Applications Requiring Space Saving Filters with Fine Filter Openings and a Large Filter Area



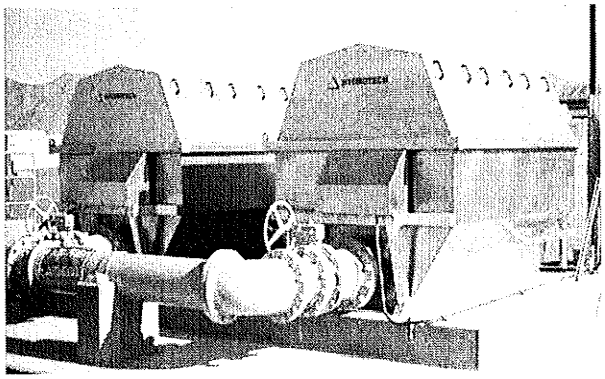
Concrete Installation

The Hydrotech Discfilter is an ideal filtration system for fine solids removal and product recovery

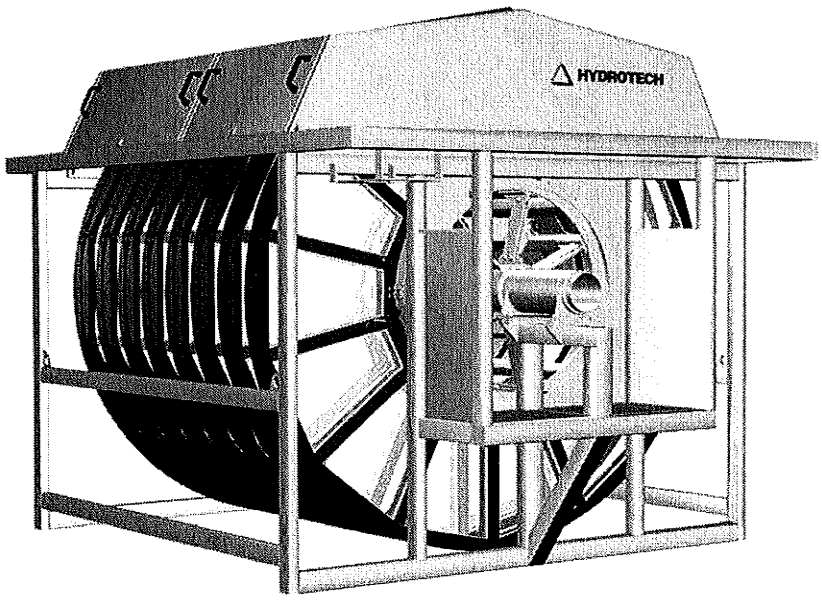
By employing woven cloth filter elements installed on multiple discs, the Hydrotech Discfilter supplies a large filter area within a small footprint.

The Hydrotech Discfilter allows for the minimization of mechanical and other ancillary equipment. The components requiring periodic maintenance are easily accessible from outside the filter. The filter's materials of construction ensure durability under the toughest conditions to allow for a trouble-free operation.

The Hydrotech Discfilter has the flexibility of being composed of 304 or 316 stainless steel. Furthermore, it supplies a large filter area within a small footprint that is up to 75% smaller than a traditional sand filter. The Hydrotech Discfilter is a cost-effective alternative to other technologies.



Tank Installation



The 2200 series Discfilter, which includes all of the standard Hydrotech benefits, is tailored for tertiary treatment applications.

Partial Submergence

Filtering at partial submergence allows multiple operational benefits. The effluent collection tank does not need to be drained to clean the Discfilter since the backwash cleaning system is above the submergence level. Additionally, flow through the filter is continuous, even during a backwash cleaning cycle the filter never goes off line. This arrangement alos allows for the effective removal of large solids and floatables.

Moving Backwash Spray Header

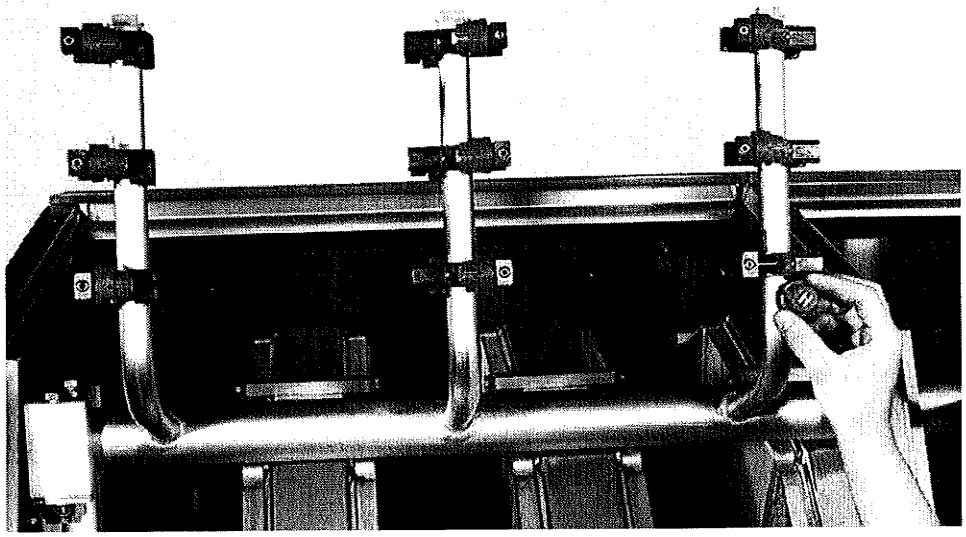
The moving backwash spray header of the Hydrotech Discfilter guarantees efficient cleaning of the filter media. This feature increases the life expectancy of the filter media and results in a 20% savings in rinse water consumption. The backwash spray header also folda out to facilitate maintenance of the spray nozzles, which can be removed and replaced without the use of any tools.

Modular Filter Panels

The modular filter panels consist of a woven polyester filter media, which is held within a stainless steel frame. With a precise pore size, the woven material of the Discfilter media allows for better filtration than filters containing non-woven media with an "average" pore size. The woven filter media is available in various pore sizes up to 1 mm.

Filter Expansion

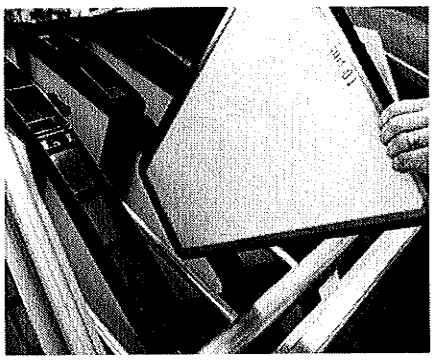
The modular panels provide a simple means of maintaining and expanding the Discfilter. The largest filter can contain up to 20 discs; however, a filter containing fewer discs can be installed with more discs added as flow rates increase.



Retractable Spray Header with Removable Spray Nozzles

Only two fasteners have to be removed to release each filter panel

This can be easily accomplished from the walkway



The filter basin does not have to be drained prior to the removal of filter media panels

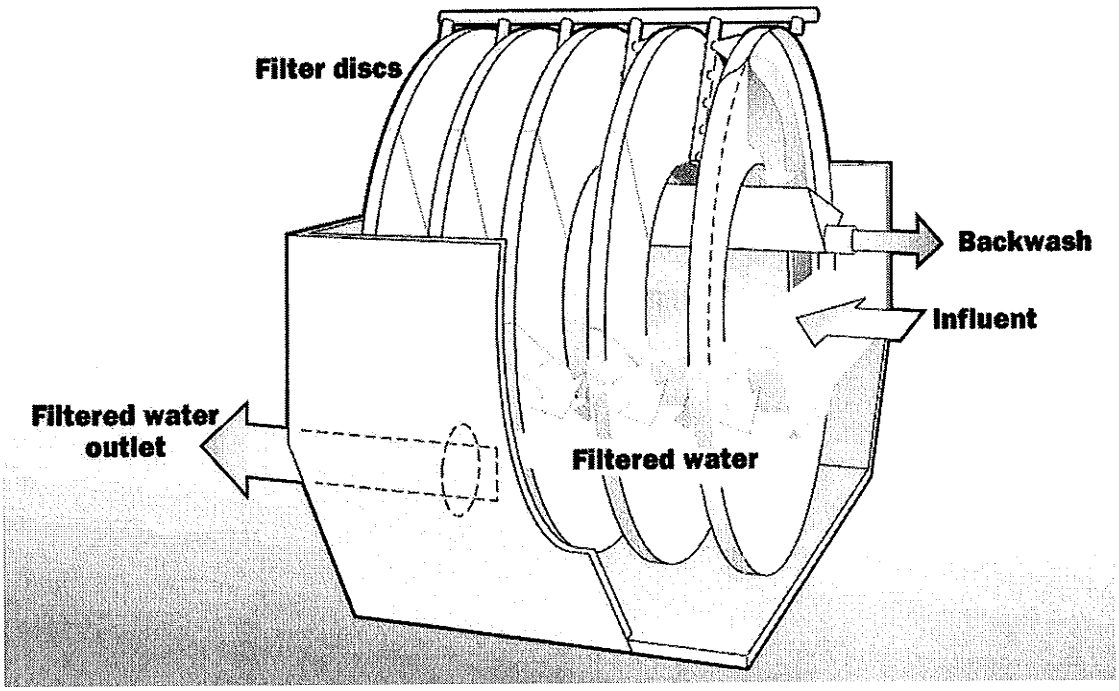
SIMPLE MAINTENANCE

The backwash spray header is retractable for easy access from the walkway. Tools are not necessary for the inspection and replacement of nozzles.

Inspection and maintenace is simple because the filter discs operate partially submerged.

The Hydrotech Discfilter's filter panels are secured to the disc by a single end cap, allowing for easy inspection and replacement from the walkay. Simple and efficient, the panel's patented design facilitates replacement without the need for expensive service or system downtime.

If operational or performance needs change, the design allows for an easy switch to a filter media with a different opening size.



PROCESS

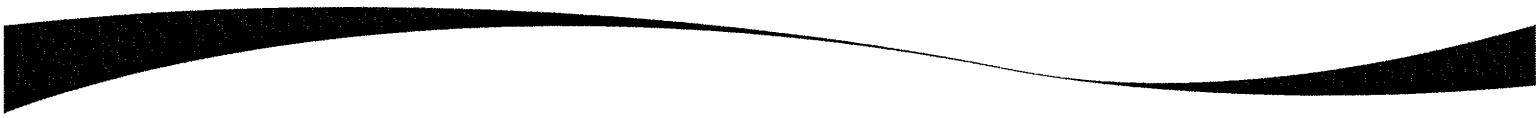
The influent flows by gravity into the filter discs from the center drum. Solids are separated from the water by the filter media mounted on the two sides of the discs, which are partially submerged. With this arrangement, the solids are retained within the filter discs while only the clean water flows to the outside of the discs and into the collection tank. Maintenance is reduced since there is no accumulation of solids in the tank.

During normal operation, the discs remain static until the water level in the inlet channels rises to a specific point, which then automatically initiates the backwash cycle. The filtered effluent provides a perfect source of backwash water, eliminating the need for a seperate source of cleaning water or an additional clean water collection tank.

Clean effluent is pumped to the backwash spray header and nozzles, washing solids into the collection trough as the discs rotate. The back-wash water required is 1-3 percent of the total flow to the filter, depending on solids loading rates. Maximum allowable head loss in continuous operation is 12 inches.

ADVANTAGES

- Meets or exceeds Title 22 requirement at various influent turbidity levels and hydraulic loading rates up to 6 gpm/ft^2
- Consistently produces quality effluent despite high-solids loadings, upsets and backwash cycles
- Available with self-contained tankage
- Capable of intallation in an existing basin
- Requires far less space than other filtration methods
- All units supplied with aluminum covers
- Simplified control system and less installation costs than other filtration technologies



Krüger

I. Kruger Inc.
401 Harrison Oaks Blvd.
Suite 100
Cary, NC 27513

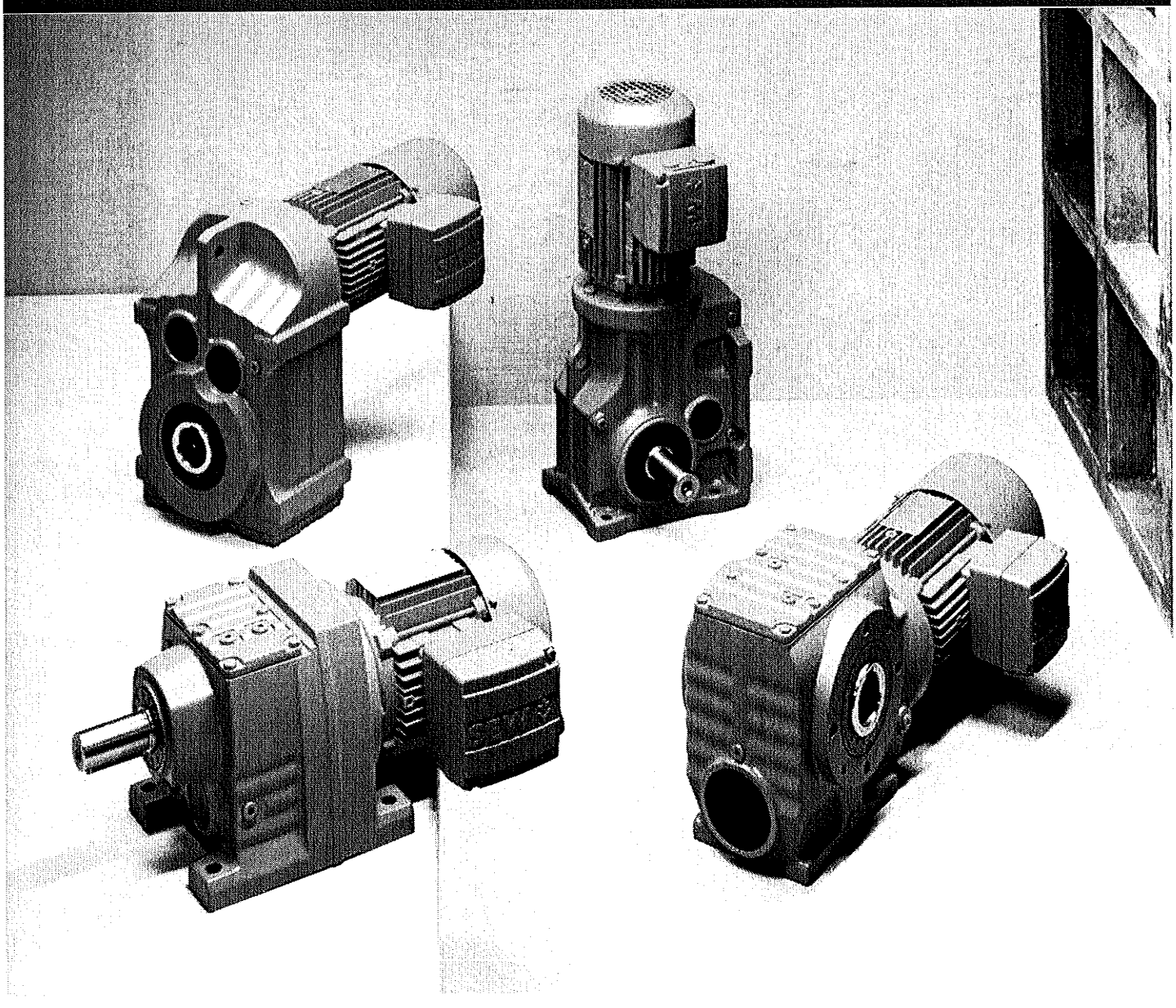
Phone 919.677.8310
Fax 919.677.0082
Website www.krugerusa.com

VEOLIA
WATER
Solutions & Technologies

SEW EURODRIVE

Always one step ahead:
The 7 Series with the right drive for every application

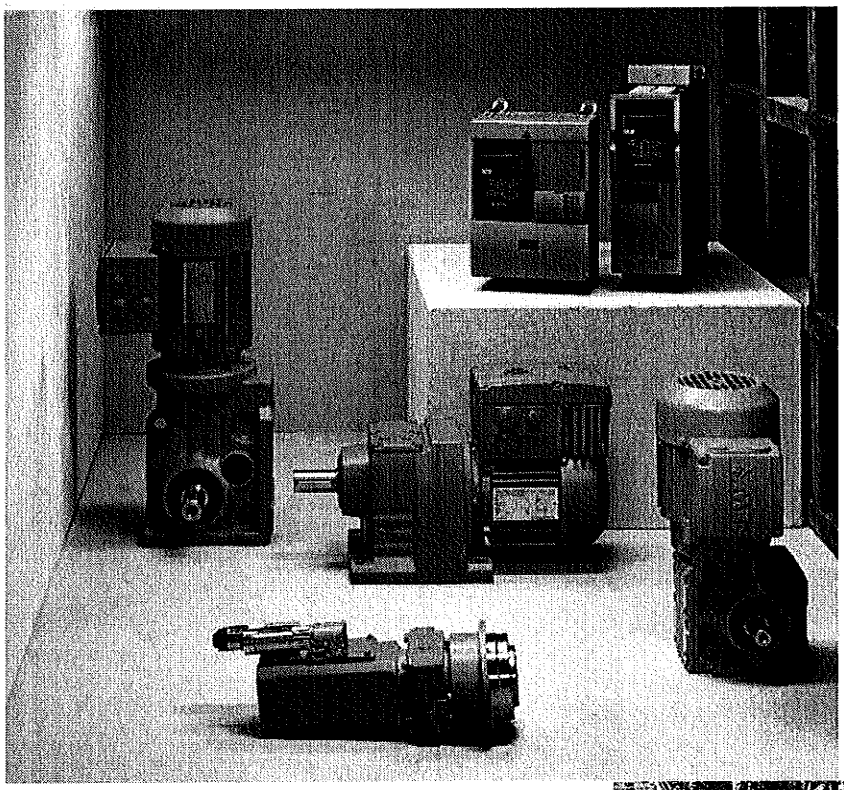
Geared motors



We don't stop at just setting standards

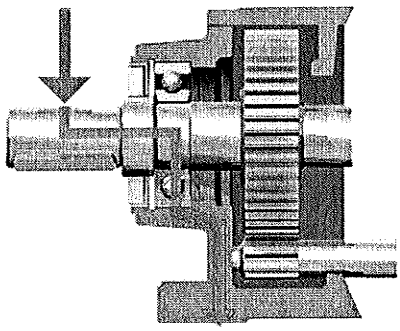
The geared motors from SEW-EURODRIVE bear a distinctive wave design on the housing. This design not only gives the motors a unique appearance easily recognized, it also characterizes the unit's hidden strengths. The results speak for themselves: leading edge technology, high impact load capacities, top power density and a wide variety of designs to suit every application.

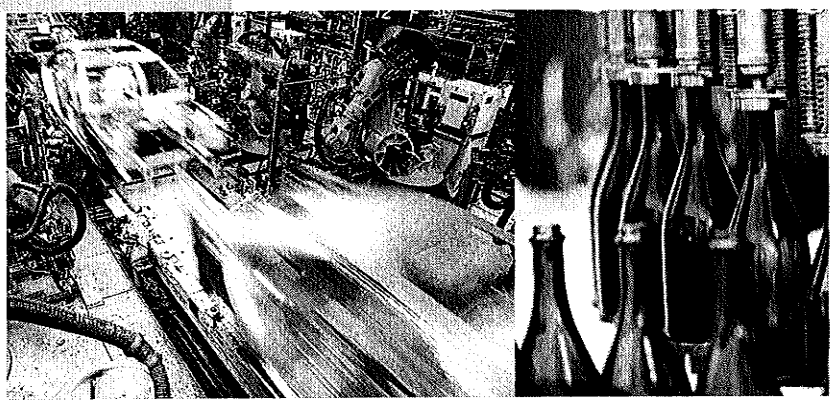
Torque and permissible overhung loads are impressively high in relation to the structural volume of the motor. This level of performance has been made possible by the compact and extremely rigid housing with its low weight and optimum magnetic flux. The sealing surfaces are not subject to any load pressure as the force flows through the one-piece housing. For maximum safety during use, all the shaft-keyway joints in the geared motors are positive connections. Precision positioning tasks are taken care of by the helical, parallel and helical-bevel geared motors, also available in reduced backlash design.



The 7 Series incorporates power and variety in a scope offered only by SEW-EURODRIVE

The optimized magnetic flux ensures that forces are not applied to the sealing surfaces and effectively prevents leakage





Driving the world: with innovative drive solutions for all branches of industry and for every application. Products and systems from SEW-EURODRIVE for any application, worldwide! SEW-EURODRIVE products can be found in a variety of industries, e.g. automotive, building materials, food and beverage as well as metal-processing. The decision to use drive technology "made by SEW-EURODRIVE" stands for safety regarding functionality and investment.

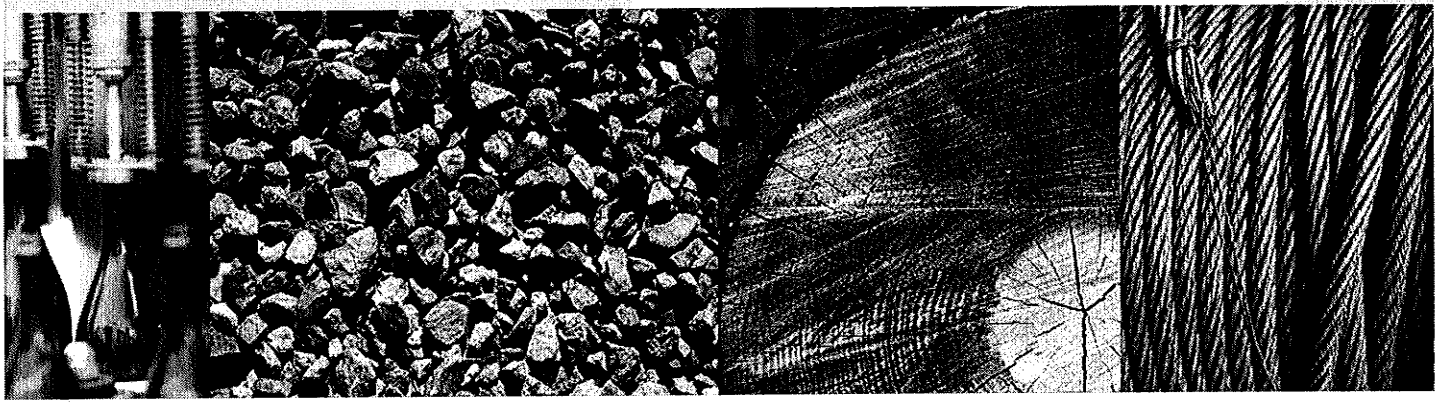
Helping you set your own priorities

You can best decide how you want to set up your system to suit your needs – the millions of combinations made possible by the modular system gives you the freedom to do just that, even as far as the type of fixture for assembly and integration into the system are concerned. Even with adapters for IEC and NEMA-compliant motors or standard market servomotors, the SEW-EURODRIVE solution fits best.

Unique not only as far as the range of sizes and gear ratios is concerned, our geared motors have even more to offer: exemplary reliability, overload capacity and long service life, the results of our proficiency in serial production. Our benchmarking criteria and quality control system eliminate every weak link in the production chain. Every component must meet the highest requirements.

Reliability and environmental friendliness are the result of our high-quality sealing concept and housing design. The use of oil seals and resilient sealing surface gaskets in combination with the favorable magnetic flux prevents leakages and prolongs maintenance-free service life.The units are also exceptionally quiet. This is achieved by precision gearing, particularly torsionally rigid housing and by the wave design that absorbs sound waves and significantly reduces noise levels.

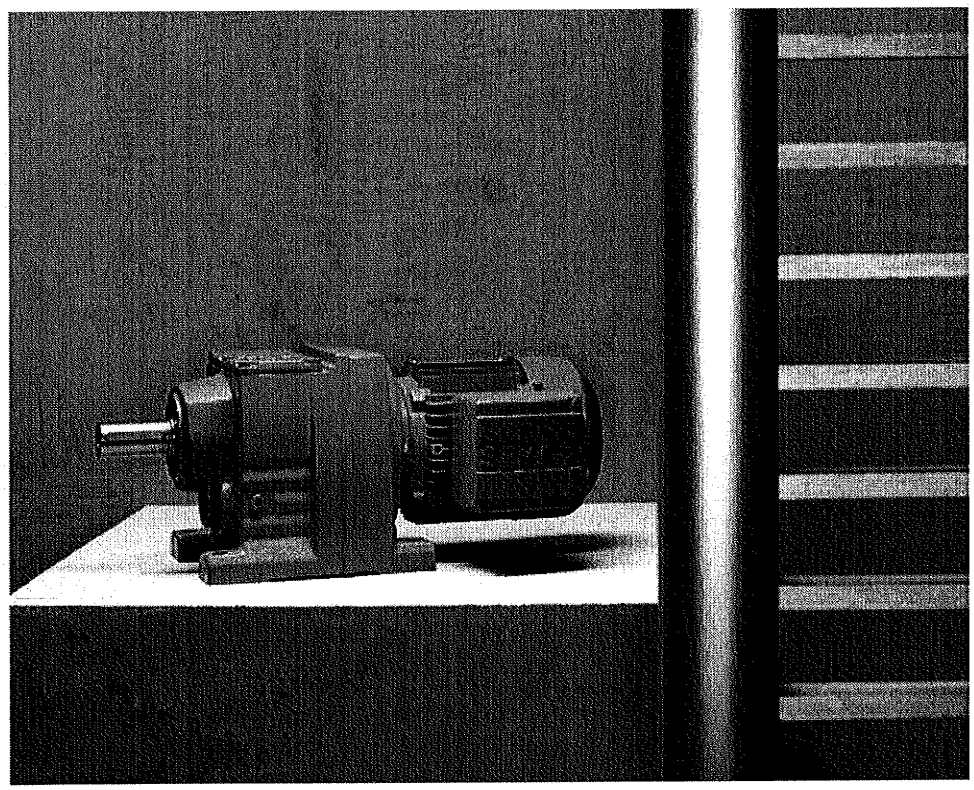
The capabilities of the geared motors illustrates clearly why SEW-EURODRIVE is represented by its drive technology in the most important branches the world over. Power density, design diversity, overload capacity and reliability give the user the security desired – optimally positioned and highly efficient in every application.



The helical geared motors for complete satisfaction

Six single-stage and thirteen multi-stage geared motors covering a power range of 70 to 18.000 Nm maintain optimum equilibrium between power and space requirements. The tried and proven modular system together with their stringent quality criteria make it possible for SEW-EURODRIVE to supply torques and gear ratios that are incomparably closely spaced and widely varied. This exceptional diversity of design sets new standards in this field of drive engineering.

More efficiency in every situation

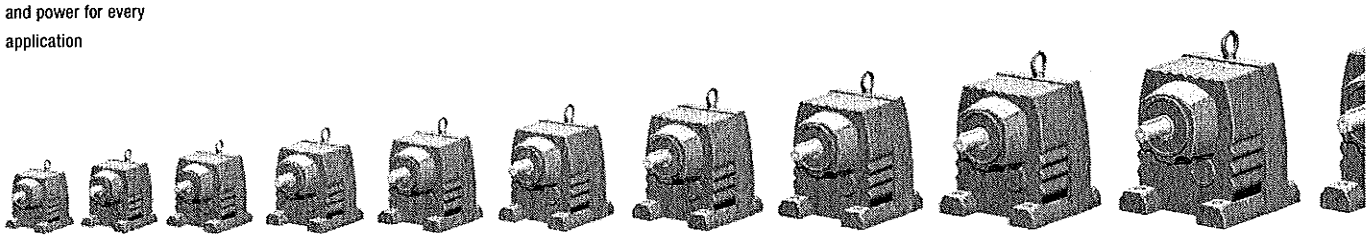


The variety of sizes allows all requirements to be met. For high output speeds, the RX57 to RX107 series of single-stage gear units offers compact solutions. And when weight-watching is an issue, we have something special to offer from our range of multi-stage gear units: The use of aluminum casting makes the R17 and R27 models particularly light – ideal for satellite drives and for use in light machine constructions.

Every design has efficient immersion lubrication and a breather valve which not only help assure performance reliability, but also secure other no less important benefits such as long service life and low maintenance requirements.

Whether with closely spaced torque steps and ratios or high output speeds – a helical geared motor fits in every situation

The complete program of helical geared motors provides the correct size and power for every application



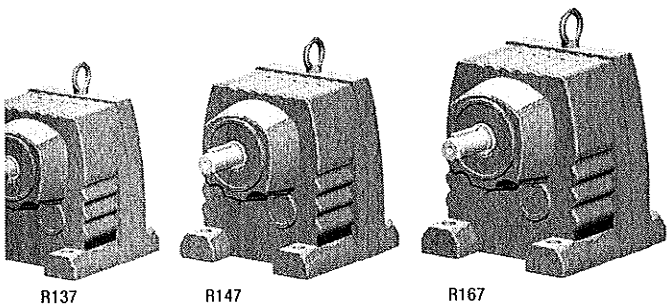
R17 R27 R37 R47 R57 R67 R77 R87 R97 R107

Helical geared motors

Type	Maximum torque [Nm]	Gear ratios	No. of ratios
RX57	70	1.30 – 5.50	14
RX67	135	1.40 – 6.07	13
RX77	215	1.42 – 8.00	16
RX87	405	1.39 – 8.65	16
RX97	595	1.42 – 8.23	15
RX107	830	1.44 – 6.63	13
R17	85	3.83 – 81.64	31
R27	130	3.37 – 135.09	35
R37*	200	3.41 – 134.82	35
R47*	300	3.83 – 176.88	43
R57*	450	4.39 – 186.89	37
R67*	600	4.29 – 199.81	36
R77*	820	5.31 – 195.24	32
R87*	1.550	5.30 – 246.54	35
R97*	3.000	4.50 – 289.74	36
R107*	4.300	4.92 – 251.15	34
R137*	8.000	5.15 – 222.60	30
R147*	13.000	5.00 – 163.31	25
R167*	18.000	10.24 – 229.71	28

Multi-stage gear units achieve gear ratios of up to i > 27.000

*** Also available in low backlash design**

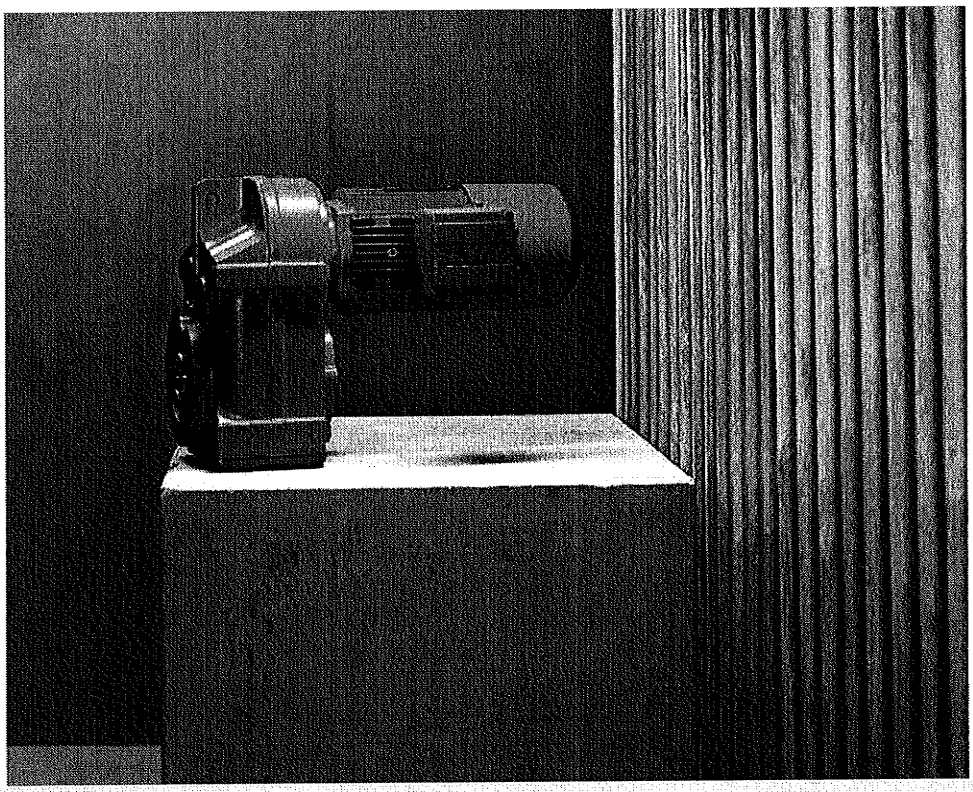


R137 R147 R167

Parallel shaft helical geared motors: the fitting solution for tight spaces

Where installation space is limited, the slim-lined parallel shaft helical geared motors cut a particularly good figure. The wide torque range providing torque from 130 to 18.000 Nm, and the many different sizes and designs means that even under the most unfavorable conditions, a wide variety of applications can be catered for.

Drives for every branch



A standard drive that is not only favored because of its constructional properties. Typically found in conveyor and materials processing applications, the parallel shaft helical geared motors from SEW-EURODRIVE can always be relied on to solve a diversity of drive tasks.

Even under the most unfavorable conditions, parallel shaft helical geared motors always find their place

Parallel shaft helical geared motors

Type	Max. torque [Nm]	Gear ratios	No. of ratios
F27	130	4.16 – 140.74	31
F37*	200	3.77 – 128.51	33
F47*	400	4.99 – 190.76	32
F57*	600	5.18 – 199.70	34
F67*	820	3.97 – 228.99	37
F77*	1.500	4.28 – 281.71	39
F87*	3.000	4.12 – 270.68	36
F97*	4.300	4.57 – 276.77	40
F107*	7.680	6.22 – 254.40	32
F127*	12.000	4.68 – 170.83	28
F157*	18.000	11.92 – 267.43	27

Multi-stage gear units make gear ratios up to i > 31.000 possible

* Also available in low backlash design

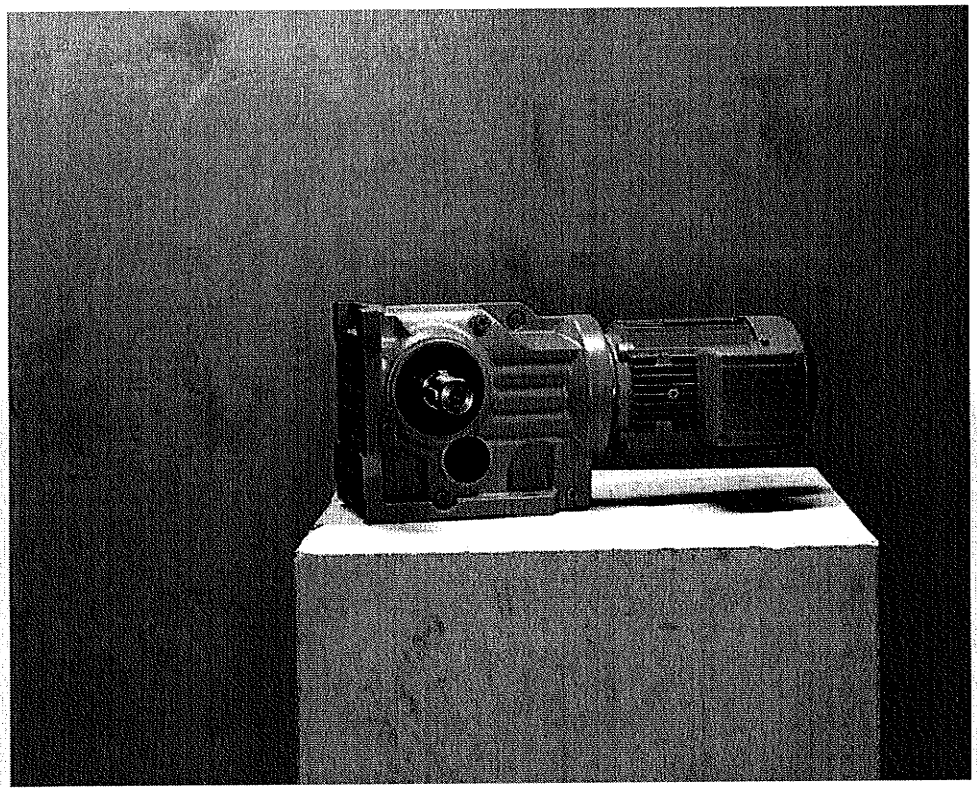
Helical-bevel geared motors yield up to 50.000 Nm on a constant basis

The principle of compact design as applied to the generation of 7 Series units is most clearly represented by the helical-bevel gear unit.These units are sophisticated angular gear units for all mechanical engineering applications demanding space-saving installation. At the same time they also provide a powerful torque range extending from 200 to 50.000 Nm.

Helical-bevel gear units from SEW-EURODRIVE provide a high degree of efficiency of over 96 percent in both torque directions and at all input speeds. A performance designed to last – high-endurance gearing gives drives full-force torques while making them wear-free.

Energy saving, low-maintenance

The remarkably high efficiency of our helical-bevel geared motors makes them into real energy-savers. The enduring maintenance-free service life is yet another reason that you can use not only AC asynchronous motors but also asynchronous and synchronous servomotors for every occasion.



Compact and strong, these bundles of energy are a popular choice for every application because of their efficiency

Helical-bevel geared motors

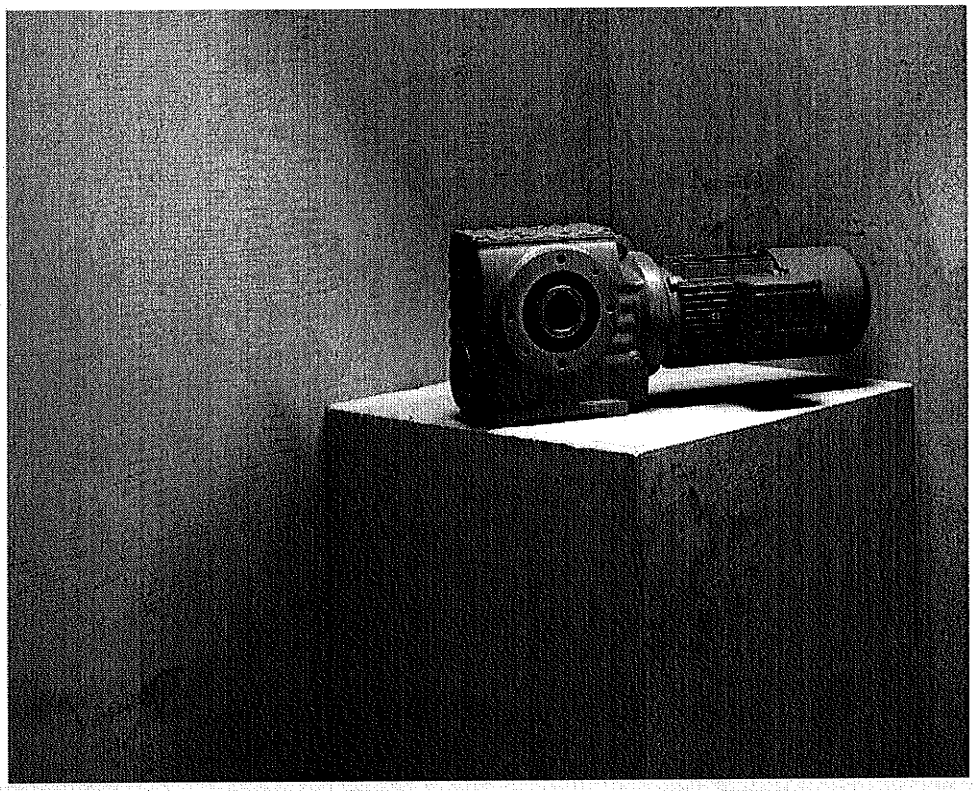
Type	Max. torque [Nm]	Gear ratios	No. of ratios
K37	200	5.36 – 106.38	25
K47	400	5.81 – 131.87	27
K57	600	6.57 – 145.14	27
K67	820	7.28 – 144.79	26
K77	1.550	7.24 – 192.18	29
K87	2.700	7.21 – 197.37	28
K97	4.300	8.71 – 176.05	25
K107	8.000	8.69 – 143.47	24
K127	13.000	8.68 – 146.07	21
K157	18.000	12.65 – 150.41	17
K167	32.000	17.34 – 164.50	15
K187	50.000	17.18 – 179.86	18

Ratios up to i > 32.000 can be achieved with multi-stage gear units.
All gear unit types are also available in low backlash design.

Helical-worm geared motors – for thinking round corners

Due to their excellent economic efficiency, these drives can be used in every branch of industry – tailored individually to torque and speed requirements. The gear ratios afforded by the worm gear stage, and the low noise levels during operation make these geared motors ideal low-cost solutions for simple applications. And yet, they can deliver quite a powerful performance: the torque ranges from 92 to 4.000 Nm.

Simple, practical and unobtrusive



Installment of angular gear units is particularly space-saving. The attenuation characteristics are a further bonus resulting from the simplicity of the mechanical design. As a result of the longitudinal application of the force on the input shaft, the torque impulses are dampened.

In spite of their strength, the noise level produced is very low, even for this type of gear unit. This means that our helical-worm geared motors can be used even for stage elevators.

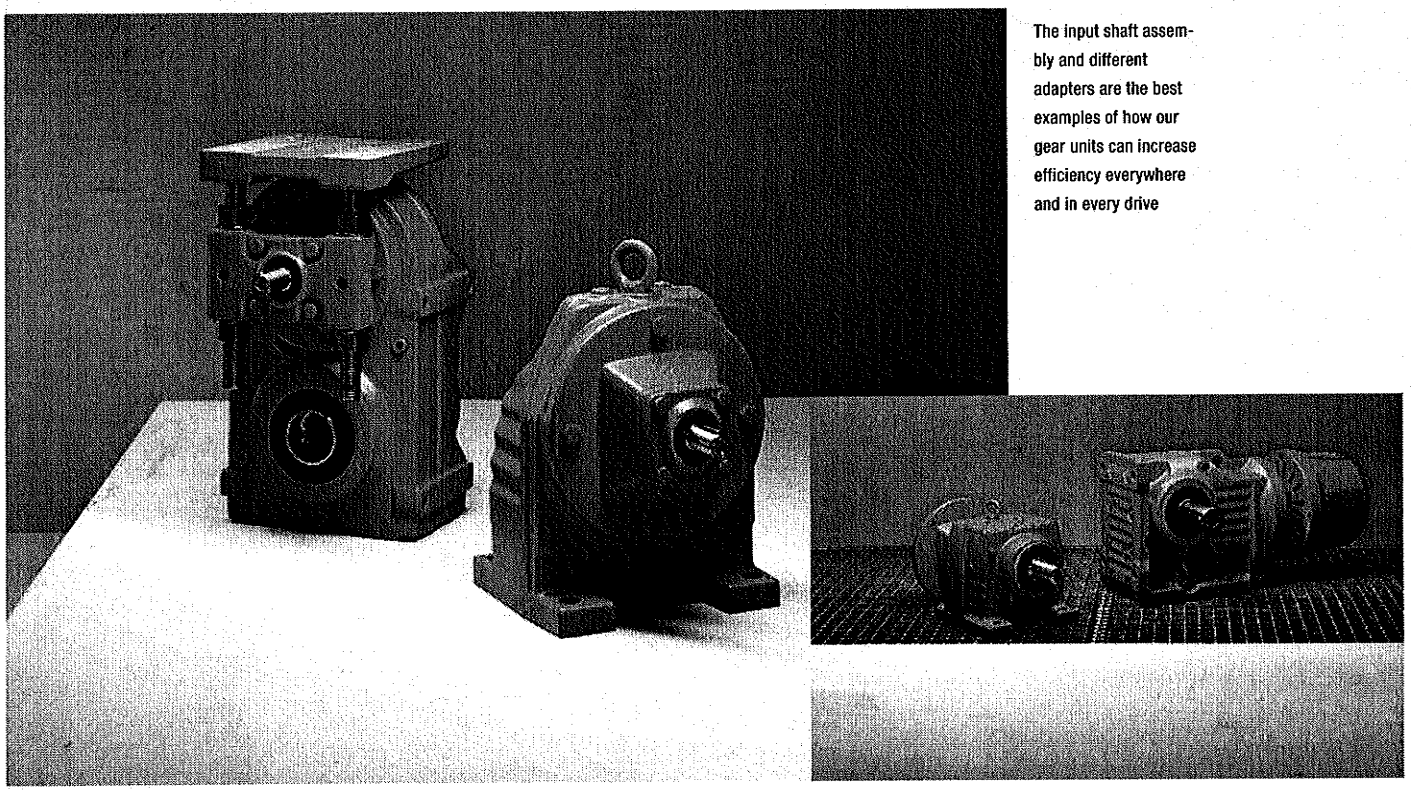
Our helical-worm gear units fill even the smallest niches in drive engineering

Helical-worm geared motors

Type	Max. torque [Nm]	Gear ratios	No. of ratios
S37	92	6.80 – 157.43	30
S47	170	7.28 – 201.00	31
S57	295	7.28 – 201.00	31
S67	520	7.56 – 217.41	33
S77	1.270	8.06 – 256.47	37
S87	2.280	7.88 – 288.00	36
S97	4.000	8.26 – 286.40	34

Multi-stage gear units make gear ratios of up to i > 33.000 possible

Flexibility even on the drive end



The input shaft assembly and different adapters are the best examples of how our gear units can increase efficiency everywhere and in every drive

In line with its family of gear units, SEW-EURODRIVE also provides optimum solutions for motorizing the drive end, increasing both flexibility and efficiency. Input covers and motor adapters are characterized by their compact dimensions, low weight and long service life. Tailored specifically to our gear units, these components ultimately increase the economic efficiency of the drive as a whole.

SEW-EURODRIVE offers eight different cover sizes for different tasks. Depending on the gear unit and drive tasks involved, these options optimize connection to the drive. Take for example height adjustment of cover's of which the motor mounting platform height adjustment simplifies assembly and startup. Or again, the integrated back stop ensuring compact drive design and optimum operation.

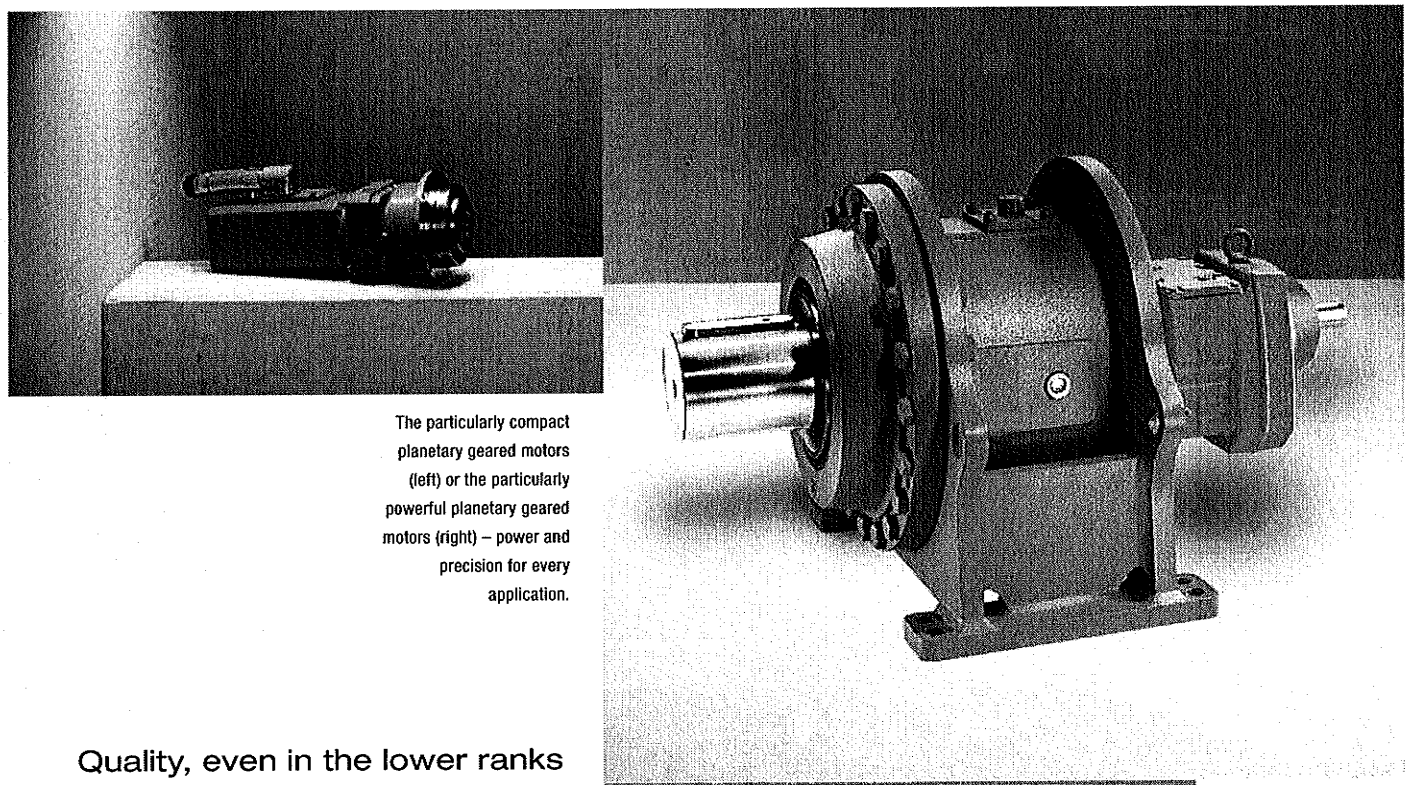
Adapters open up more possibilities
In addition to the integrated torque limiting coupling, there are also a variety of adapters with integrated hydraulic centrifugal couplings. As a standard, the centrifugal coupling comes with protection against overheating and it can optionally be equipped with an integrated mechanical brake and/or integrated backstop. The AM adapter series means that all IEC motors in sizes 63 to 280 and all NEMA motors in sizes 56 to 365 can be fitted to the 7 Series gear units. The AQ adapter is for servomotors; these can be either servomotors with interlocking keyed connections (AQA) or non-positive connections with clamping ring hubs (AQH).

Planetary geared motors for moving with the greatest precision, even in the largest applications

The compact, low backlash planetary gear units in both single–stage and multi-stage design can handle the most demanding positioning tasks – powerfully and with the utmost precision. The compact design of these units is particularly advantageous when it comes to cramped space conditions.

The highest quality in both production and assembly guarantee circumferential backlash of less than six angular minutes or less than three angular minutes in the reduced versions. Additional measures can even produce circumferential backlash of less than one angular minute. This low backlash together with a wide variety of integer ratios delivers the highest possible precision in all positioning tasks.

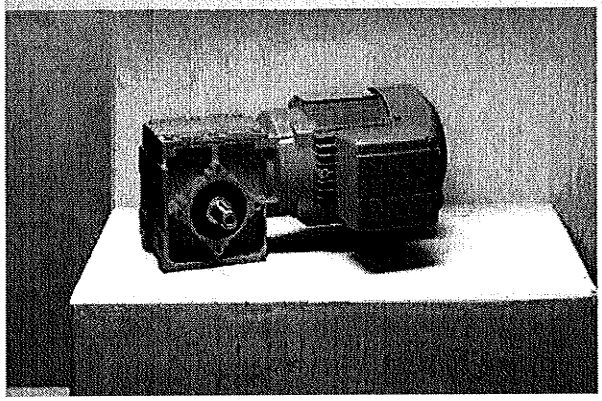
The big jobs, such as typical heavy engineering tasks, are taken care of by our heavy duty industrial gear units. The helical gear, bevel gear, and planetary gear units reliably produce torque of more than 1.000.000 Nm.



The particularly compact planetary geared motors (left) or the particularly powerful planetary geared motors (right) – power and precision for every application.

Quality, even in the lower ranks

The single-stage SPIROPLAN® right-angle geared motors deliver their power reliably and quietly: in a power range of up to 0.09 to 1.1 kW, the Spiroplan series delivers output torques of up to 70 Nm thanks to the particularly quiet, wear-free gearing.
In combination with its compact design and light-weight aluminum housing, the unit is almost perfectly discreet.



The SPIROPLAN® angular geared motors round off the range and variety of our geared motors program to perfection

Discover the endless possibilities – all you need is a PC

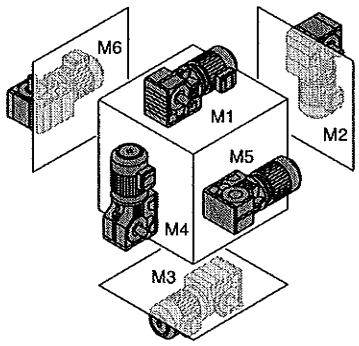
Even without detailed knowledge of our products, you can use the EKAT, our electronic catalog, to find the right drive quickly and simply. You only need to enter values such as power, torque, speed and gear unit type. The EKAT is a straight-forward PC application for Windows 95/98/NT4.0/2000.

The data of the complete gear unit program including planetary gear units with AC motors and drives with particularly low speed ranges are contained in EKAT. For quick and focused product selection, specification data input is supported by both graphics and texts. The selection of certain search options optimizes the display of all the relevant products.

By displaying the most important data in the selection list, it is possible to quickly compare the different products. For a better comparison of different drives, for instance the different kinds of gear unit types with the same motor, several selection lists can be displayed simultaneously beside each other.

Put your unit exactly where you want it - our mounting positions make it possible

Once you have chosen the right type of unit for the job, you have to find the right mounting position. Our mounting positions make this an easy task: you just select the installment position for the gear unit from only six different mounting positions, M1 to M6. This simple principle is based on the standardization of the mounting positions for all the gear unit types and the reduction of the mounting position designations.



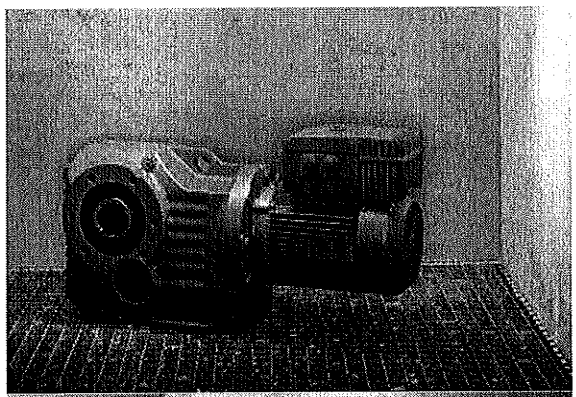
Intelligent electronics to smarten up our drives

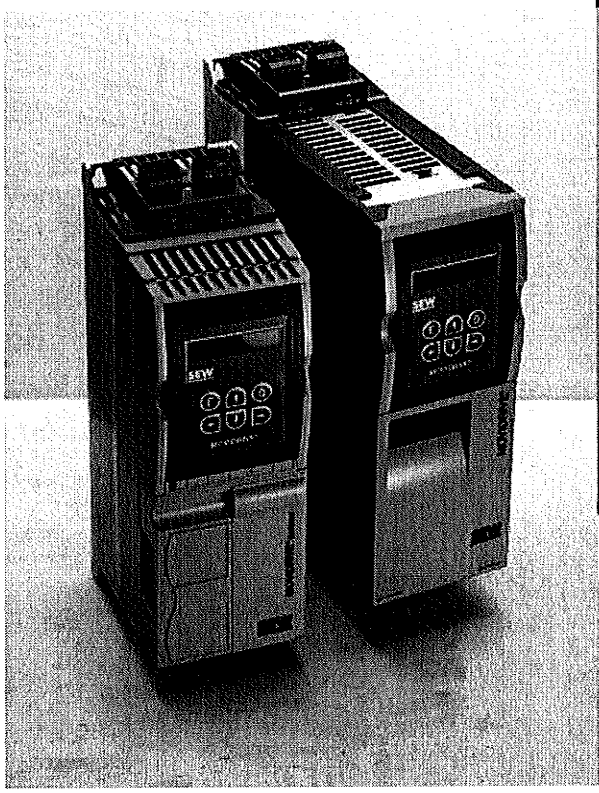
In the field of drive electronics we have the right solutions for every requirement and every task. Take, for instance, our frequency inverters: MOVITRAC® 31C for every application, with a power range of 0.55 to 55 kW, or MOVITRAC® 07, the compact frequency inverter, providing comprehensive functionality together with simple operation.

Our intelligent drive inverters, MOVIDRIVE® and MOVIDRIVE® *compact*, are equipped with the IPOS$^{plus®}$ positioning and sequence control as a standard. This optional functionality allows even the most difficult drive tasks to be resolved economically and flexibly.

We have complete future-safe system solutions for decentralization purposes. MOVIMOT®, the geared motor with the integrated frequency inverter, and MOVI-SWITCH®, the geared motor with the integrated circuit breaker and protective function are the compact specialists for decentralized drive application. The custom-designed field distributors and cable systems round off our system to help you optimize the implementation of your decentralized systems and engineering concepts.

This program will always have the perfect solution for you: MOVIMOT® (right) MOVIDRIVE® and MOVIDRIVE® *compact* (below left) or MOVITRAC® (below right)





0919 0511 / 0401

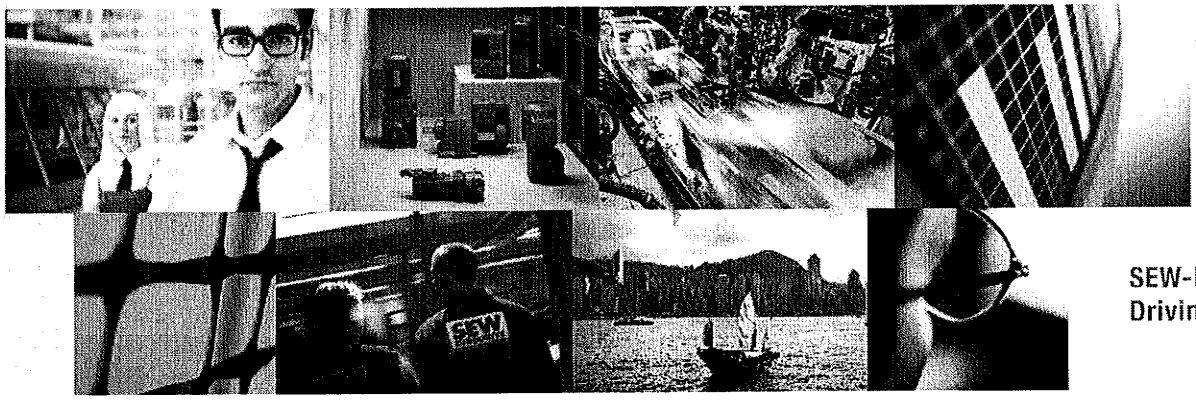
How to drive the world

With people who think right faster and develop the future with you.

With drives and controls that automatically improve your work performance.

With comprehensive knowledge of the most important branches of industry today.

With uncompromising quality whose high standards will simplify daily operations.



SEW-EURODRIVE
Driving the world

With innovative ideas that offer a solution for tomorrow's problems today.

With a service network that is always close at hand around the world.

With a global presence for quick and convincing solutions. Anywhere.

With an Internet presence that is available around the clock and offers information as well as software updates.

SEW-EURODRIVE is right there for you:

Argentina
Tel. (0 33 27) 45 72 84
Fax (0 33 27) 45 72 21

Australia
Tel. (03) 99 y33 10 00
Fax (03) 99 33 10 03

Austria
Tel. (01) 6 17 55 00-0
Fax (01) 6 17 55 00-30

Belgium
Tel. (0 10) 23 13 11
Fax (0 10) 23 13 36

Brazil
Tel. (0 11) 64 60-64 33
Fax (0 11) 64 80-46 12

Canada
Tel. (9 05) 7 91-15 53
Fax (9 05) 7 91-29 99

Chile
Tel. (02) 6 23 82 03
6 23 81 63
Fax (02) 6 23 81 79

China
Tel. (0 22) 25 32 26 12
Fax (0 22) 25 32 26 11

Colombia
Tel. (05 71) 5 47 50 50
Fax (05 71) 5 47 50 44

Czech Republic
Tel. 02/20 12 12 34/35/36
Fax 02/20 12 12 37

Denmark
Tel. 4395 8500
Fax 4395 8509

Finland
Tel. (3) 58 93 00
Fax (3) 7 80 62 11

France
Tel. 03 88 73 67 00
Fax 03 88 73 66 00

Great Britain
Tel. 19 24 89 38 55
Fax 19 24 89 37 02

Hong Kong
Tel. 2-7 96-04 77
Fax 2-7 95-91 29

Hungary
Tel. (01) 2 02 74 84
Fax (01) 2 01 48 98

India
Tel. (02 65) 83 10 86
Fax (02 65) 83 10 87

Italy
Tel. 02-9 69 80-1
Fax 02-96 79 97 81

Japan
Tel. (0 53 83) 7 38 11-13
Fax (0 53 83) 7 38 14

Malaysia
Tel. (07) 3 54 57 07
3 54 94 09
Fax (07) 3 54 14 04

Mexico
Tel. (5) 8 88-18 16 + 18 31
Fax (5) 8 88-20 06

Netherlands
Tel. (0 10) 4 46 37 00
Fax (0 10) 4 15 55 52

New Zealand
Tel. (09) 2 74 56 27
2 74 00 77
Fax (09) 2 74 01 65

Norway
Tel. (69) 24 10 20
Fax (69) 24 10 40

Peru
Tel. (5 11) 349-52 80
Fax (5 11) 349-30 02

Poland
Tel. (0 42) 6 16 22 00
Fax (0 42) 6 16 22 10

Portugal
Tel. (02 31) 20 96 70
Fax (02 31) 20 36 85

Russia
Tel. (8 12) 3 26 09 41
5 35 04 30
Fax (8 12) 5 35 22 87

Singapore
Tel. 86 21 701-705
Fax 8 61 28 27

South Africa
Tel. (0 11) 4 94 43 80
Fax (0 11) 4 94 23 00

South Korea
Tel. (0 31) 4 92-80 51
Fax (0 31) 4 92-80 56

Spain
Tel. 9 44 31 84 70
Fax 9 44 31 84 71

Sweden
Tel. (0 36) 34 42 00
Fax (0 36) 34 42 80

Switzerland
Tel. (0 61) 4 17 17 17
Fax (0 61) 4 17 17 00

Thailand
Tel. (0 38) 21 45 29 / 30
Fax (0 38) 21 45 31

Turkey
Tel. (2 16) 4 41 91 63
Fax (2 16) 3 05 58 67

USA
Tel. (8 64) 4 39-87 92
75 37
Fax (8 64) 9 49 30 39

Venezuela
Tel. (0 41) 32 95 83
Fax (0 41) 38 62 75

SEW-EURODRIVE GmbH & Co
P.O.Box 30 23 · D-76642 Bruchsal/Germany
Phone +49-72 51-75-0 · Fax +49-72 51-75-19 70
→ www.sew-eurodrive.com

Commercial & Industrial Products

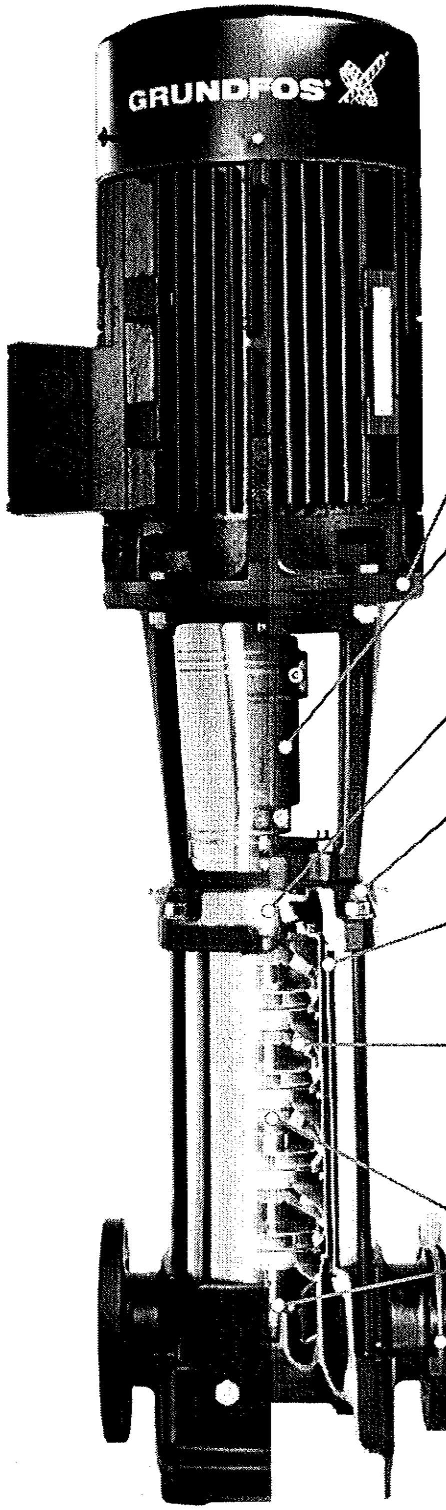
GRUNDFOS

CR

Vertical, multi-stage, centrifugal pumps for a wide range of applications

Features
Benefits

- Configured for a broad range of high-pressure applications, Grundfos CR pumps offer a space-saving, vertical in-line design that provides easy installation for both new and retrofit systems. Competitively priced, CR pumps feature corrosion-resistant stainless steel or titanium construction for extended reliability and performance. High efficiency design helps reduce operating costs and minimizes downtime for maintenance and repairs.
- All 60 HZ Grundfos CR pumps are direct-coupled to a standard NEMA-C Face motor for rigidity. 50 HZ motors are IEC for convenient local service. Self-adjusting mechanical shaft seals offer maintenance-free reliability and are rated to 250°F and 435 PSI for standard models and to 355°F with the optional *Cool Top*™. Impellers, chambers, shaft and guide vanes are fabricated of stainless steel or titanium for quiet and efficient long-term operations.



CR 32, 45, 64, & 90

Pump Bearing Plate
Optional plate allows use of a standard motor bearing.

Motor Coupling
Ample spacing between motor and pump shaft allows for a seal change without removing the motor (15-60 HP only).

Cartridge Shaft Seal
Pump disassembly not required to change the seal.

Split-Pump-Head
Provides greater flexibility plus a cast stainless pump head option for aggressive fluids.

O-Ring Sleeve Sealing
Prevents sleeve joint leaks even during wide temperature swings.

Highly Efficient Hydraulic Design
Chamber and impeller design, coupled with laser welding, provide efficiencies greater than 80%.

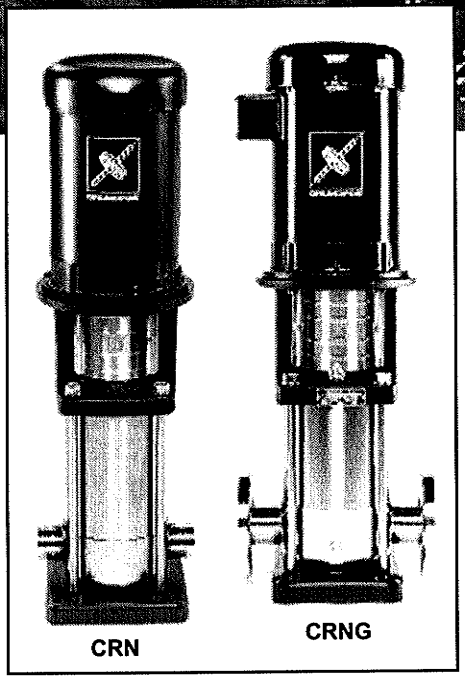
Wear Resistant Bearings
Heavy duty intermediate (Graflon® or Bronze) and bottom bearing (Tungsten carbide).

Flexible Connections
Universal flange system–flexible and easy to install.

Common Applications: *Deaera [illegible] ps for Fire Protection*
• Water Treatment: RO, DI and Filtration • [illegible] ms • Electronic Manufacturing
• Parts Washers • Lumber and Mining • [illegible] ical: Refinery and Offshore

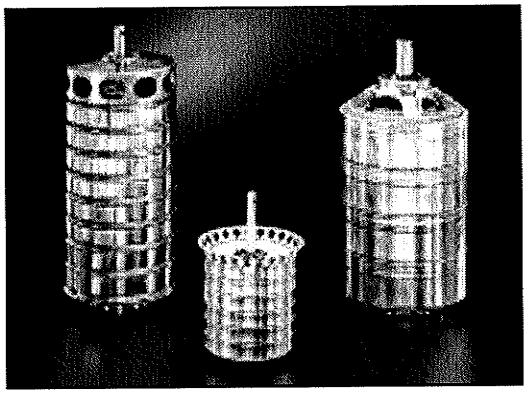
Special Construction

In CRN units, the pumped fluid comes in contact only with stainless steel components. The 316 stainless steel makes these upgraded units ideal for pumping deionized water and light chemicals.



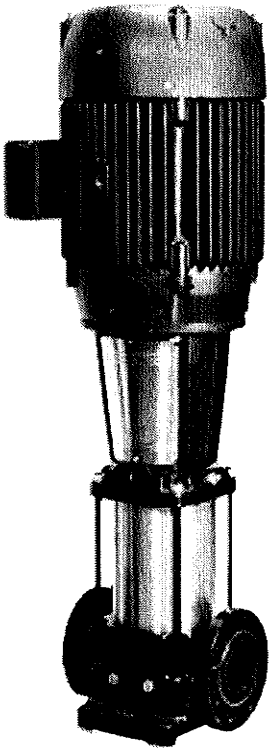
CRN CRNG

Service Kits and Tools



"The STACK®" allows fast, on-site pump repairs. This pre-assembled, ready-to-install rebuild kit includes the pump shaft, impellers, chambers and all associated hardware.

Add your choice of many seal kit configurations and you have a "new pump."



CR-90

Maximum 60 HP,
630 GPM,
80%+ efficiency

Operating Specs

Fluid Temp: 5° to 250°F – optional to 355°F

Flow Range: 1.2 to 630 GPM

Head Range: 0 to 1,005 ft.

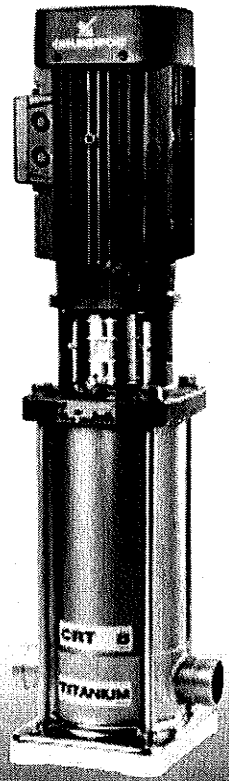
Max. Working Press.: 360/435 PSI – optional to 653 PSI

Max. Ambient Temp: 104°F – higher when the motor is derated

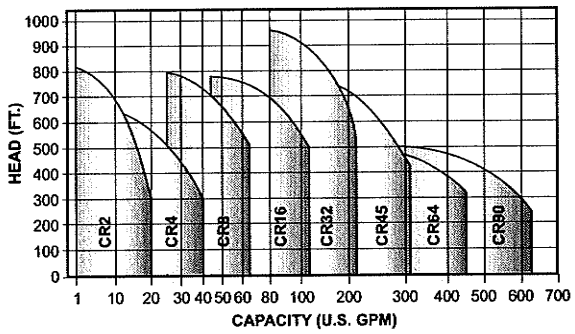
HP Range: 1/2 to 60 HP

Titanium too

Grundfos CR models are now available up to 115 GPM for salt water, chloride based fluids, and other fluids which require titanium for long life. Ask for the CRT2, CRT4, CRT8, and CRT 16.



CR Performance Range



GRUNDFOS

CHI/CHIE/CH/CHN

Multi-purpose, stainless steel pumps for commercial/industrial applications

Features Benefits

CHI/CHIE/CH/CHN

- TEFC Motor
- UL Approved to US and Canadian Standards
- Bellows Type Shaft Seals
- Dual and Tri-Voltage Motors
- NPT Connection

CHI

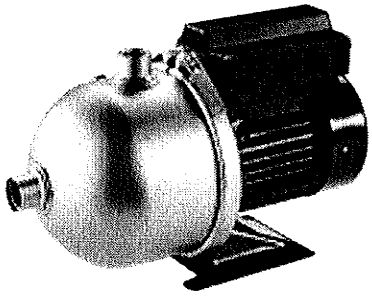
- All Liquid-Exposed Components Constructed of 316 Stainless Steel

CHN

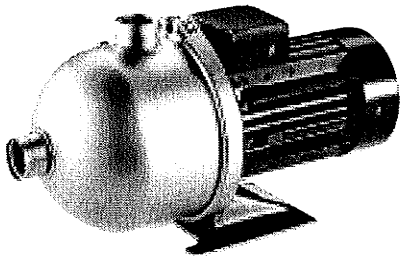
- All Liquid-Exposed Components Constructed of 304 Stainless Steel

CH

- All Liquid-Exposed Components Constructed of 304 Stainless Steel and Cast Iron Suction and Discharge

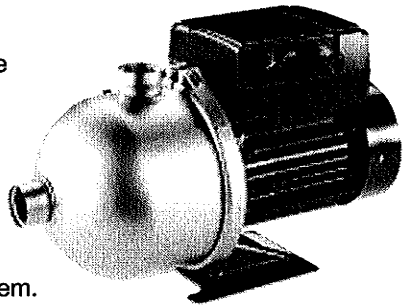


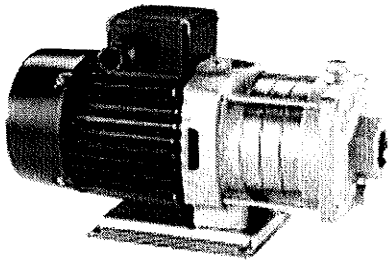
CHI



CHIE provides all the benefits of the CHI, plus a fully integrated variable speed motor (1 x 230 volts), set-point potentiometer, and PI controller.

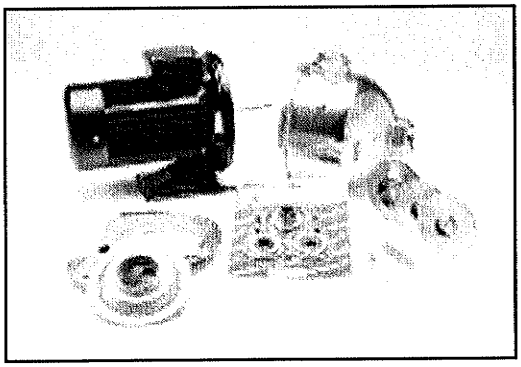
Also available, the CHIE-Plus™ includes all of the above, plus a pressure transducer, expansion chamber, and gauge; a complete system.



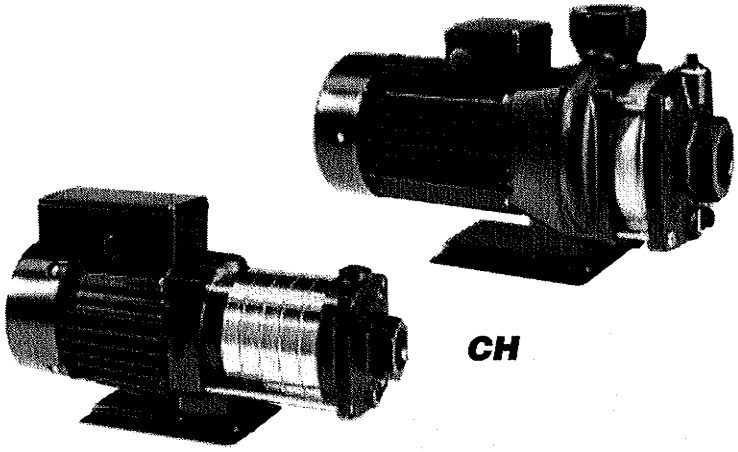


CHN

Service Kits and Tools

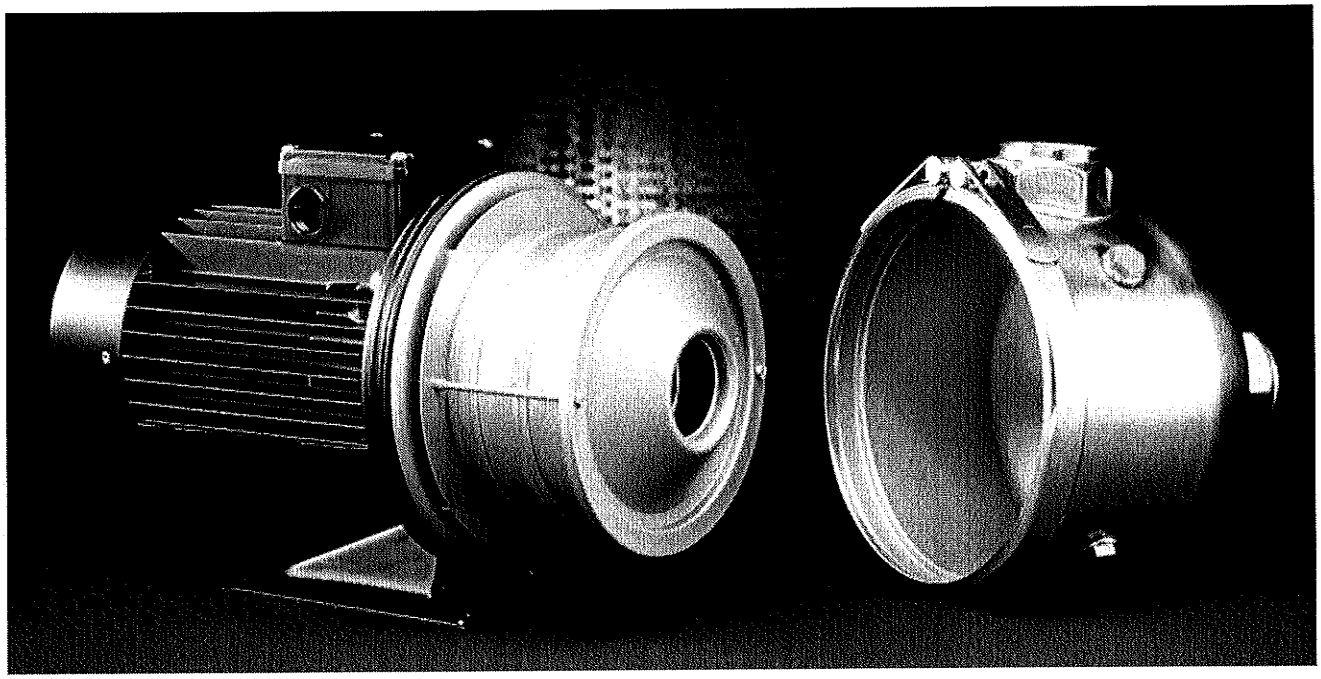


Seal kits, separate motors and pump components are readily available for service or repair.



CH

Common Applications: *D. I. Water • Hot and Cold Liquids • Oils • Mild Acids • Aromatic Hydrocarbons • Potable Water • Alkalis*



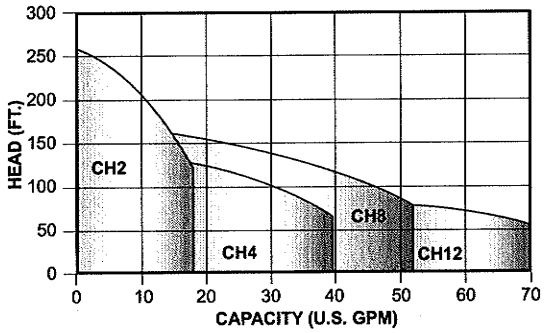
CH Model Range

Models	Flow Range (GPM)	Suction	Discharge	HP Range
CH2	1.3 - 18	1" NPT	1" NPT	1/2 - 1-1/2
CH4	2.2 - 40	1-1/4" NPT	1" NPT	3/4 - 1
CH8	3.5 - 53	1-1/2" NPT	1-1/4" NPT	1 - 2
CH12	5.2 - 70	1-1/2" NPT	1-1/2" NPT	2

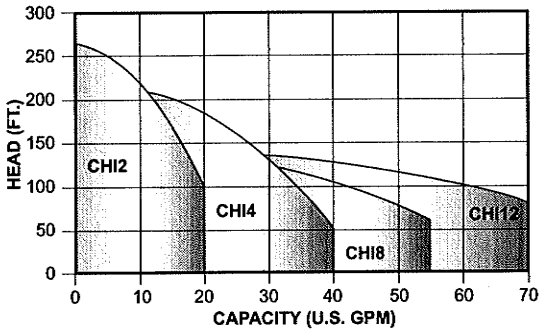
CHI Model Range

Models	Flow Range (GPM)	Suction and Discharge	HP Range
CHI2	1.2 - 20	1" NPT	1/3 - 1
CHI4	3.0 - 40	1-1/4" NPT	1/3 - 1-1/2
CHI8	4.0 - 55	1-1/2" NPT	3/4 - 1-1/2
CHI12	6.0 - 70	1-1/2" NPT	1/2 - 2

CH Performance Range



CHI Performance Range*



*CHIE does not cover all CHI models.

E-pump™

Grundfos pumps powered by the new, variable frequency drive (VFD) MLE motors.

Features Benefits

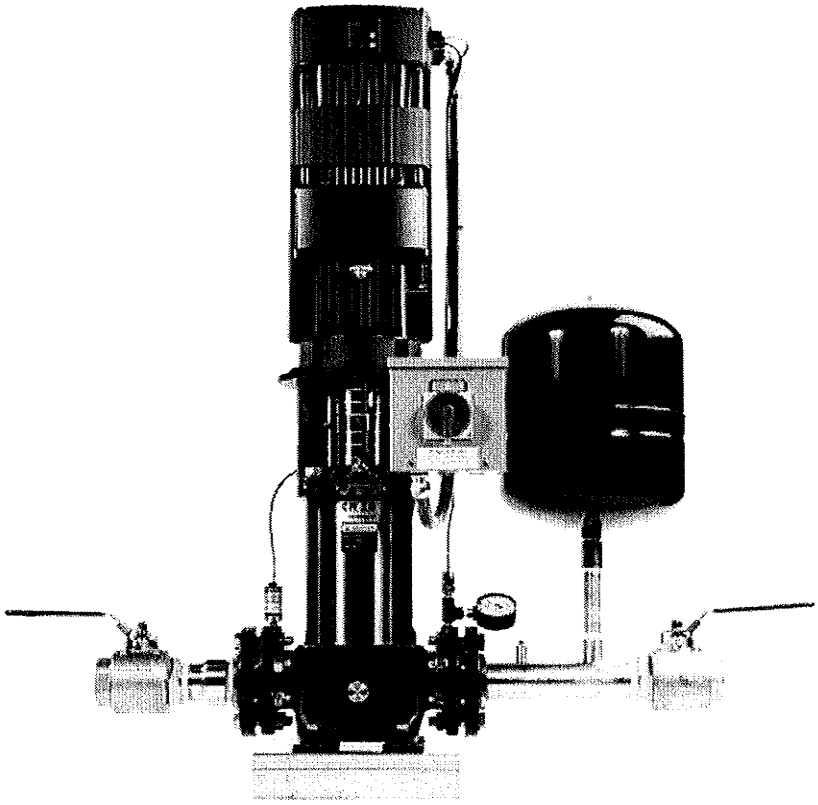
- E-pump products are new from Grundfos, combining state-of-the-art frequency converter technology with the well-known range of Grundfos pumps for building, industrial, irrigation, and municipal applications.
- E-pump models are available in single or three-phase. Single-phase Grundfos MLE motors with a built-in PI controller and connections for external control signals are available in sizes of 1/3 - 1-1/2 HP.
- The new three-phase MLE motor offers motor sizes of 1 - 10 HP. In addition to a built-in PI controller, connections for external signals, and set-point selection, this motor can also communicate with the Grundfos remote control unit, the R100. The R100 offers a number of additional control features, data collection, and print functions with an optional hand-held printer.
- E-pump models are available with or without a factory installed pressure sensor.

Common Applications:

Industrial • Commercial • Irrigation • Municipal

CRE-Plus™

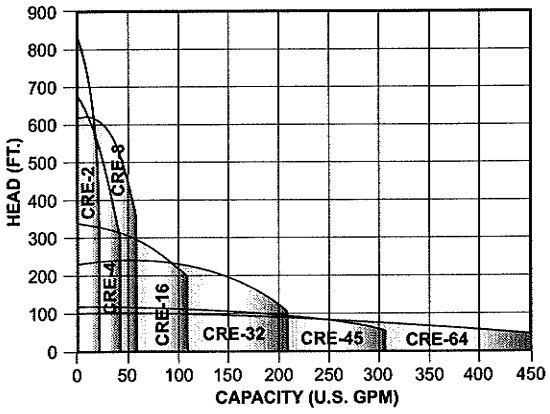
Single pump, CRE system, "plug-n-play"



CRE-Plus

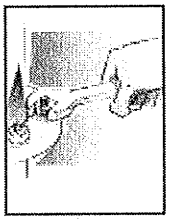
CRE-Plus provides all system components in a "plug-n-play" package. Systems are available in single and three phase.

CRE-Plus Performance Range



The All-In-One E-pump... The Optimum Answer

Compared to a set-up consisting of a separate pump, frequency converter and sensor, E-pump products provide a number of clear advantages:

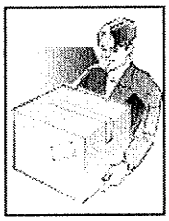


Easy installation:

An E-pump is just as easy to install as a standard pump. Once connected to the mains, the pump is ready for operation. All internal connections and settings are made at the Grundfos factory.

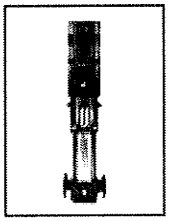
Cost effective:

Variable speed pumps use less energy, reduce pump wear, and do not require periodic adjustments.



Every component from the same supplier:

With pumps, frequency converters and sensors from one supplier, sizing, selection and ordering could not be simpler. The Grundfos service department offers total product service.



Flexible:

An E-pump is so flexible that it is possible to adapt it to any application. Just a few types replace many standard pumps. E-pump products are ideal when pumps need replacing.

GRUNDFOS

BoosterpaQ®

Compact, high-pressure booster systems for universal, broad applications.

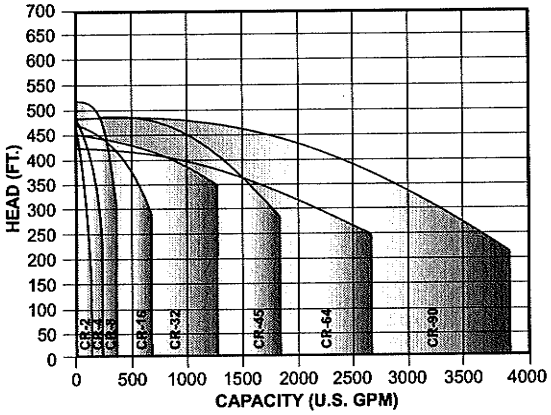
Features Benefits

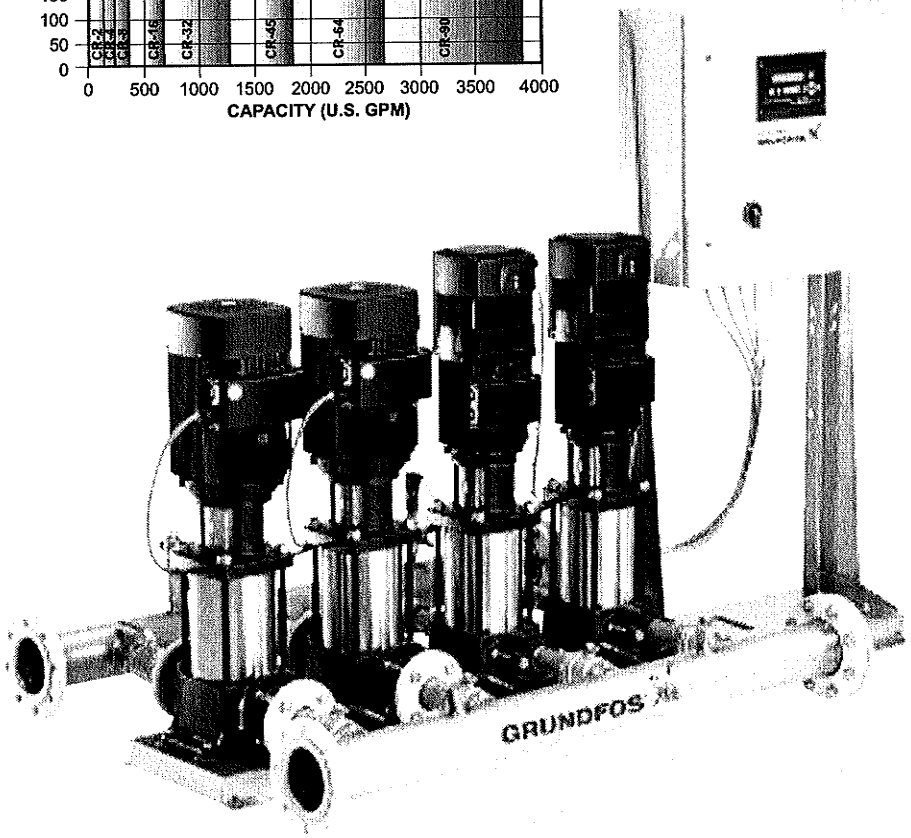
- The pumps are the rugged Grundfos type CR multi-stage centrifugal pumps. They guarantee reliable and trouble-free operation with optimum efficiency, compactness and easy service. Grundfos MLE motors with built-in frequency converters are just one of the unique optional features of the BoosterpaQ system.
- The advanced controller with simple operation is characteristic of the BoosterpaQ range. The controller can switch the system on/off or regulate the frequency of up to six parallel connected pumps to maintain constant pressure regulation. As a result, your system will operate efficiently over wide flow ranges.
- BoosterpaQ systems are compact. The pumps are fitted with intake and discharge manifolds, including all necessary shut-off and non-return valves. Pressure transmitters ensure instant regulation. The 304 stainless steel frame and 316 stainless steel manifolds, apart from being corrosion-free, ensure water quality and cleanliness. Minimum pressure loss is assured by specially designed non-return valves.

Operating Specs

Fluid Temp: 5° to 176°F – optional higher rating
Max. Flow: 3,800 GPM
Head Range: 0 to 500 ft.
Max. Working Press.: 250 PSI – additionally limited by the tank rating
Max. Ambient Temp: 104°F – higher when motors are derated
HP Range: 1 to 50 HP – system total 300 HP, 6 pumps

BoosterpaQ Performance Range

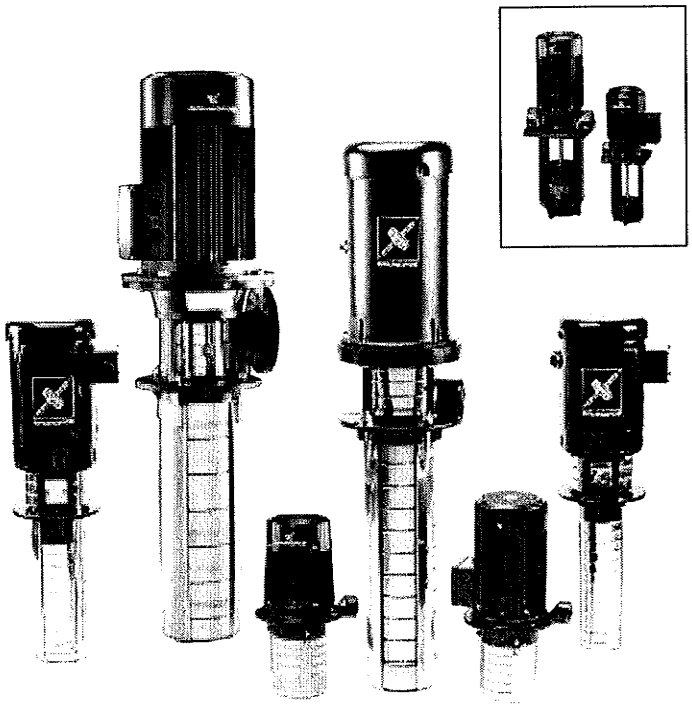




Common Applications: Commercial Buildings • Industrial Plants • Landscaping • Municipal • Agricultural

SPK/CRK/MTR/MTC/MTA

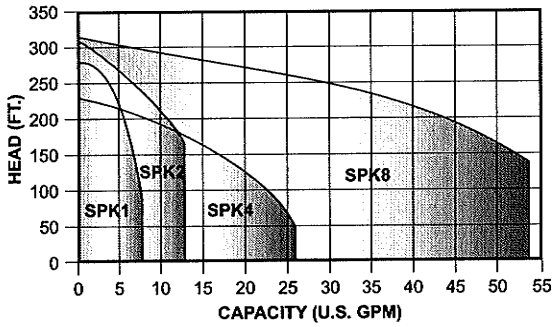
Compact, multi-stage and single stage, centrifugal, immersible pumps for tank mounting



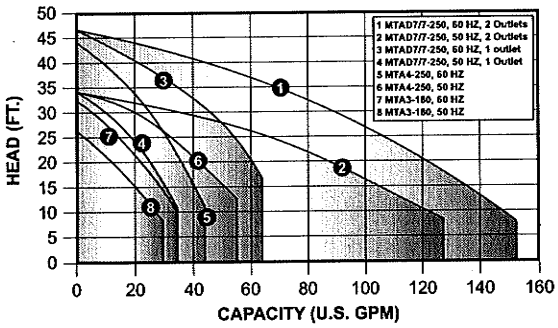
Features Benefits

- Compact in size, Grundfos immersible multi-stage centrifugal pumps are engineered for various liquid handling applications. Typical applications include machine tool coolants, EDM, industrial parts washers and boiler condensate. Applicable liquids include hot and cold water, mixtures of water and water soluble cooling and cutting oils, and other thin, clean, non-aggressive and non-explosive liquids.
- Featuring maintenance-free mechanical seals, they are self-priming, self-venting and are designed to operate at pressures up to 350 PSI and temperature extremes of 15° - 210°F. A positive priming screw eliminates dry running. The unique suction strainer can be removed for easy maintenance.
- The highly efficient design of the Grundfos immersible pumps features stainless steel construction for vital components, assures corrosion-free reliability and saves energy costs.
- The Grundfos SPK, CRK and MTR pumps are direct-coupled and available with either NEMA-C Face or IEC and 50 HZ or 60 HZ motors. The MTC extended shaft motor design eliminates the need for a coupling, resulting in a very low profile design for restricted height applications. Grundfos immersible pumps are designed to be mounted vertically.
- Models MTC 8, 12, and 16, featuring the same design and features as MTC2 and MTC4, were recently added to extend the performance range.
- Another new addition, the MTA pump provides a performance range which fits lathes, grinders, small mills, and other applications.
- Grundfos coolant pumps SPK, CRK, and MTR are available with the Grundfos MLE, variable speed motor. Variable speed pumps provide the right flow and pressure, save energy, and when demand varies, they often eliminate the requirement for multiple pumps.

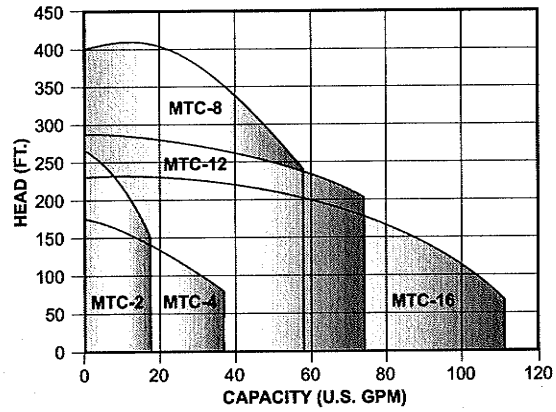
SPK Performance Range



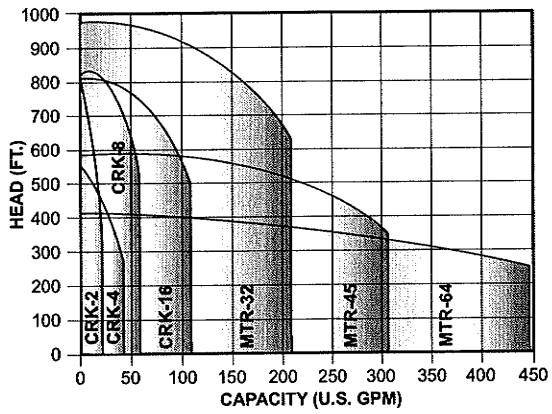
MTA Performance Range



MTC Performance Range



MTR/CRK Performance Range

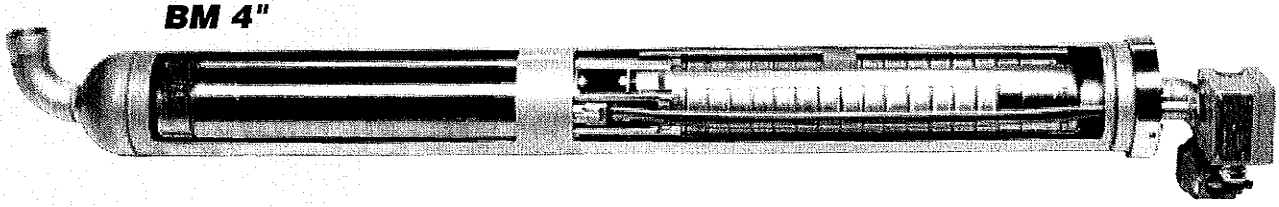


Common Applications: *Machine Tool Coolant • Parts Washing • Filtration • Transfer and Drainage • Pressure Boosting • Deionized Water • Hot/Cold Washdown*

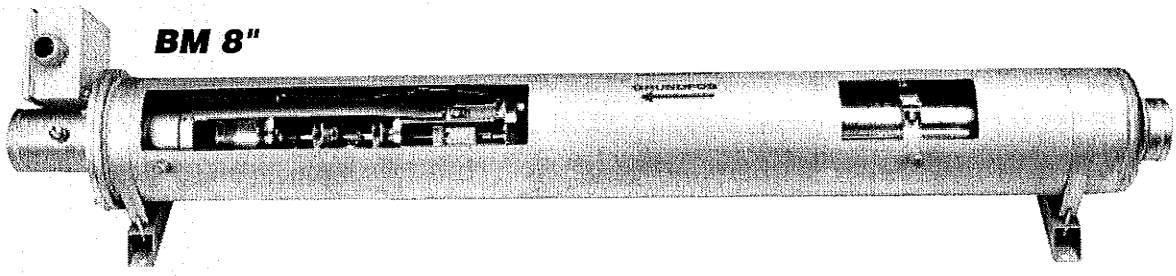
BM

Sealess, multi-stage pumps for high-pressure application

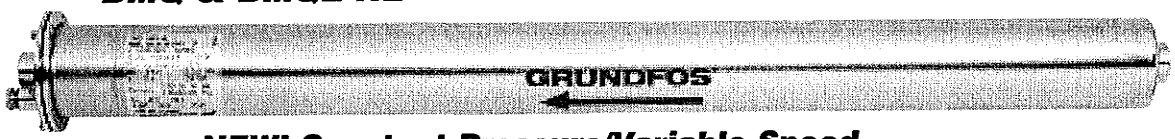
BM 4"



BM 8"



BMQ & BMQE-NE



NEW! Constant Pressure/Variable Speed.

Features Benefits

- Stainless steel booster sleeve provides for an extremely quiet and safe-to-operate module
- Radial bearings are lubricated by the pumped liquid, requiring no additional lubrication or maintenance
- No-seals to leak or replace.
- Standard materials are 316 stainless steel for the pump and motor. Some motors are 904L and pump ends are available in 904L upon request. 304 stainless steel construction is available for less demanding applications.

Operating Specs

Max. Fluid Temp: 104°F – optional higher temperatures for 6" (140°F) and 8" (194°F) motors

Max. Flow: BM 1,100 GPM; BMQ 42 GPM

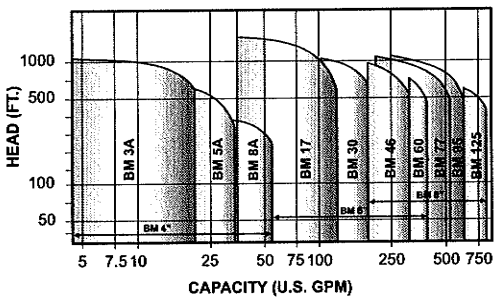
Max. Developed Head: BM 1,600 ft.; BMQ 700 ft.

Max. Working Press.: 1,100 PSI (4" & 6"), 1,015 PSI (8")

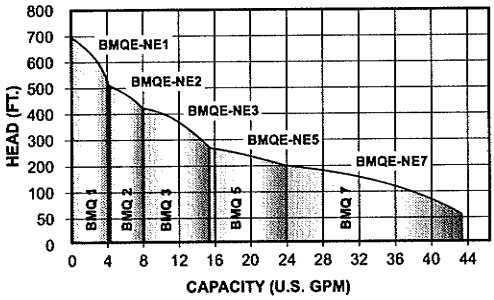
HP Range: BM 5 to 125 HP – optional to 200 HP; BMQ 1.5 HP

50 HZ or 60 HZ

BM Performance Range (60 HZ shown)



BMQ Performance Range



Common Applications: *Ultrafiltration • Reverse Osmosis • Pressure Boosting • Wash-Down • Circulation*

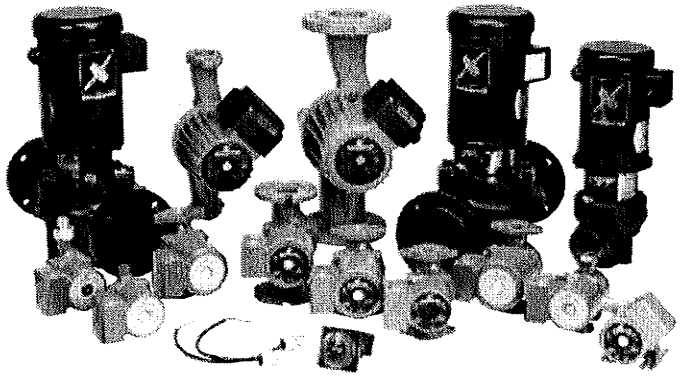
Quick Application Guide

	Series CR, CRE & CRE-Plus Pumps	Series SPK/CRK/ MTR/MTC/MTA Pumps	Series HS Pumps (END SUCTION NOT SHOWN)	BoosterpaQ®	Series CH/CHN/CHI Pumps	Series BM & BMQ Pumps
Aqua Farming						
Boiler Feed		< 194°F				
Chilled Water						
Circulation						
Condensate Transfer						
Cooling Towers						
Cooling Units						
Deaerators						
Deionized Water					CHI only	
De-Watering						
Dosing Systems						
Drainage						
Effluent						
Filter Systems						
Filtration						
Fountains						
Glycol Solutions						
Graywater						
HVAC						
Industrial						
Irrigation						
Liquid Transfer						
Machine Tool Coolants						
Marine Service					CHI only	
Municipal Water Supplies						
Paint Booth						
Parts Washing						
Pressure Boosting						
Process Water						
Quench Water						
Reverse Osmosis						
Sump						
Swimming Pools (Commercial)						
Ultra Filtration						
Washdown						
Water Treatment						
Specifications						
Capacity in U.S. GPM	1.2 - 630	1.2 - 450	0 - 175	0 - 3800	1.2 - 70	0 - 1500
Total Head in Feet	0 - 1005	0 - 970	0 - 160	0 - 500	0 - 265	0 - 1600
HP	1/2 - 60	1/2 - 40	1/3 - 7-1/2	1.0 - 300 *****	1/3 - 2	1 - 250
Temperature Range (°F)	-40° - 355°	14° - 210°	180° *	5° - 176° ***	**	0° - 104° ***
Max. Working Pressure	435 PSI ***	435 PSI	125 PSI	250 PSI ****	145 PSI	1160 PSI

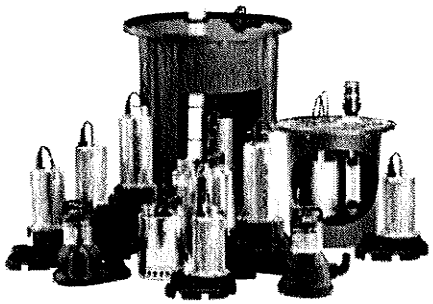
*For continuous duty, 211°F for intermittent duty **5°F to 230°F for CHI, 32°F to 194°F for CH
***Higher upon request ****Limited by the selected tank *****Total system HP, 6 pumps

GRUNDFOS

Other Grundfos Products

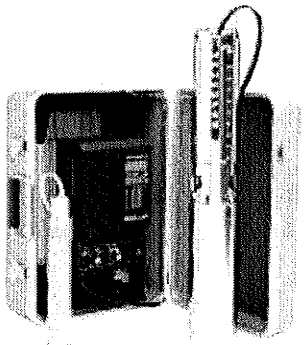


HVAC Products



SSE Products

Environmental Products



Groundwater Products

VISIT US ON THE WEB AT

www.us.grundfos.com

Ask us about our "CI" CD Rom, which includes WinCAPS® pump sizing and selection software program, technical specifications, and other new information.

GRUNDFOS

Leaders in Pump Technology

Grundfos Pumps Corporation
3131 N. Business Park Avenue, Fresno, CA 93727
(559) 292-8000 FAX (559) 291-1357
Customer Service Centers
Allentown, PA • Fresno, CA
(800) 333-1366 FAX (800) 333-1363

member gama

Grundfos Canada, Inc.
2941 Brighton Rd.
Oakville, Ontario L6H 6C9, Canada
(905) 829-9533 FAX (905) 829-9512

Bombas Grundfos de Mexico, S.A. de C.V.
Boulevard TLC #15
Parque Industrial Stiva Aeropuerto
C.P. 66600, Apodaca, N.L. México
52-8-144-4000 FAX 52-8-144-4010

Available from:

Performance curves and technical information listed as a range only and subject to change without notice. Consult a Grundfos product submittal data sheet for exact pump specifications.

L-CI-SL-001 | Rev. 8/00
PRINTED IN USA

LIMITED WARRANTY

Products manufactured by GRUNDFOS PUMPS CORPORATION (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by Grundfos are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact the Grundfos factory or authorized service station for instructions. Any defective product to be returned to the factory or service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

GRUNDFOS®

Leaders in Pump Technology

Grundfos Pumps Corporation • 3131 N. Business Park Avenue • Fresno, CA 93727
Customer Service Centers: Allentown, PA • Fresno, CA
Phone: (559) 292-8000 • Fax: (559) 291-1357
Canada: Oakville, Ontario • Mexico: Apodaca, N.L.

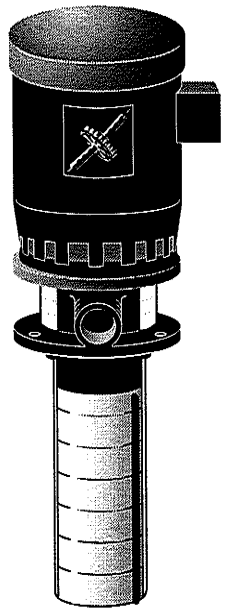
Visit our website at www.us.grundfos.com

L-SPK-TL-003 | Rev. 4/01
PRINTED IN USA

SPK/CRK/MTR
COOLANT PUMPS

Installation and Operating Instructions

CONTENTS



Please leave these instructions with the pump for future reference

GRUNDFOS®

Leaders in Pump Technology

SAFETY WARNING

Shock Hazard

A faulty motor or wiring can cause electrical shock that could be fatal, whether touched directly or conducted through standing water. For this reason, proper grounding of the motor frame to the power supply's grounding terminal is required for safe installation and operation.

In all installations, the above-ground metal plumbing should be connected to the power supply ground as described in Article 250-80 of the National Electrical Code.

Electrical Work

All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

WARNING:

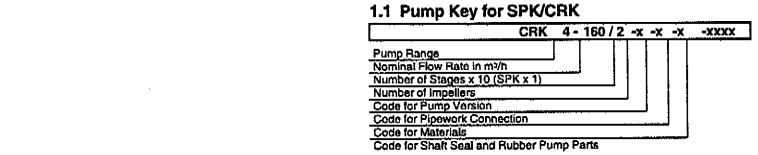
The safe operation of this pump requires that it be grounded in accordance with the National Electrical Code and local governing codes or regulations. Connect the ground wire to the grounding screw in the terminal box and then to the **acceptable** grounding point.

Pre-Installation Checklist

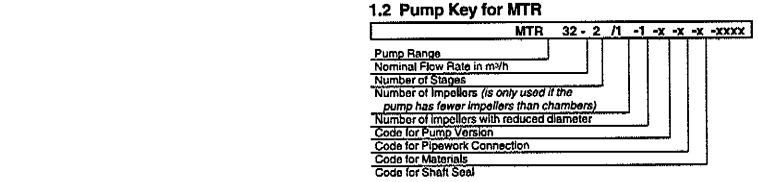
1. Confirm You Have The Right Pump

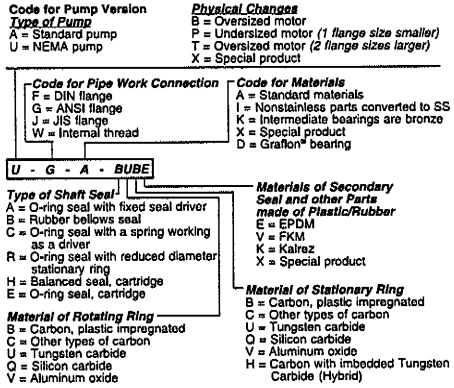
- Read the nameplate to ensure it is the one you ordered
- Compare the pump's nameplate data or its performance curve (for head, GPM, etc.) with the application in which you plan to install it.
  Will it do what you expect it to do?

1.1 Pump Key for SPK/CRK



1.2 Pump Key for MTR





2. Check the Condition of The Pump

The shipping carton your pump came in is specially designed around your pump during production to prevent damage. As a precaution, it should remain in the carton until you are ready to install it. At that point, look at the pump and examine it for any damage that may have occurred during shipping. Examine any other parts of the shipment as well (electrical control boxes, etc) for any visible damage. If you find any, contact the transportation company in writing and ask to have it inspected.

3. Electrical Requirements

Supply Power

The incoming electrical supply should be verified so the voltage, phase and frequency match that of the pump motor. The proper operating voltage and other electrical information can be found on the motor nameplate. These motors are designed to run on ±10% of the nameplate-rated voltage. For dual-voltage motors, the motor should be internally connected to operate on the voltage closest to the 10% rating, i.e., a 208 voltage motor wired per the 208 volt connection diagram. Wiring connection diagrams can be found on the plates attached to the motor.

If voltage variations are larger than ±10%, do not operate the pump.

Field Wiring

Wire sizes should be based on the current carrying properties of a conductor as required by the latest edition of the National Electrical Code or local regulations. Direct on line (D.O.L.) starting is approved due to the extremely fast run-up time of the motor and the low moment of inertia of pump and motor. If D.O.L. starting is not acceptable and reduced starting current is required, an auto transformer or resistant starter should be used. It is suggested that a fused disconnect be used for each pump where service and standby pumps are installed.

Motor Protection

1. **Single-Phase Motors:**
   With the exception of 7 ½ and 10 HP motors (which require external protection) single-phase SPK/CRK pumps are equipped with multi-voltage, squirrel-cage induction motors with built-in thermal protection.

Installation Procedures

2. **Three-Phase Motors:**
SPK/CRK/MTR Pumps with three-phase motors must be used with the proper size and type of motor-starter to ensure the motor is protected against damage from low voltage, phase failure, current imbalance and overloads. A properly sized starter with manual reset and ambient-compensated extra quick trip in all three legs should be used. The overload should be sized and adjusted to the full-load current rating of the motor. Under no circumstances should the overloads be set to a higher value than the full load current shown on the motor nameplate. This will void the warranty.

Overloads for auto transformers and resistant starters should be sized in accordance with the recommendations of the manufacturer.

4. Glance Through This Guide

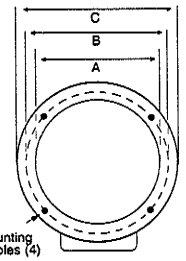
Even if you are very familiar with the installation of this pump, a quick glance through the remaining sections of this guide may help you avoid a potential problem.

Installation Procedures

Installing The Pump

Pump Location

Grundfos SPK/CRK/MTR pumps are designed for tank-mounting and may be installed in either a vertical or horizontal orientation. Where the unit is to be installed so as to position its mounting flange below the liquid level or in a pressurized tank, a gasket must be fitted between the pump's mounting flange and tank.



Pump Model	ØA	ØB	ØC	Discharge	Mounting Hole Dia.
SPK1/2/4/8 (NEMA)	5.5" (140)	6.3" (160)	7.1" (180)	1 ¼" NPT	0.28" (7)
SPK1/2/4 (IEC)	3.9" (100)	4.5" (115)	5.1" (130)	¾" BSPT	0.28" (7)
SPK8 (IEC)	5.5" (140)	6.3" (160)	7.1" (180)	1 ¼" BSPT	0.28" (7)
CRK2/4 (NEMA)	5.5" (140)	6.3" (160)	7.1" (180)	1 ¼" NPT	0.37" (9.5)
CRK2/4 (IEC)	5.5" (140)	6.3" (160)	7.1" (180)	1 ¼" BSPT	0.30" (7.5)
CRK8/16 (NEMA)	7.9" (200)	8.9" (225)	9.9" (250)	2.0" NPT	0.35" (9)
MTR32	7.5" (190)	8.7" (220)	9.9" (250)	2 ½" ANSI	0.47" (12)
MTR45/64	9.5" (240)	10.5" (265)	11.4" (290)	2 ½" ANSI	0.47" (12)

Pipework

The discharge ports of SPK/CRK pump units which are supplied for use with NEMA motors have 1¼ inch female NPT threads. Other discharge pipe sizes must be accommodated via the use of appropriate adapter bushings.

Suction Conditions

The bottom of the pump strainer must be at least 1.0 inch above the bottom of the tank. The pumps are designed to provide full performance down to a level of A mm above the bottom of the strainer.

At a liquid level between A and B mm above the bottom of the strainer, the built-in priming screw will protect the pump against dry running.

MTR32, 45 and 64 pumps have no priming screw.

Figure 1: CRK2/4-SPK1/2/4/8

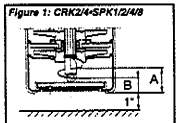


Figure 2: CRK8/16

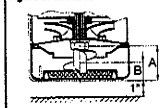
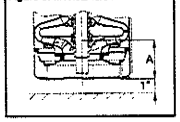


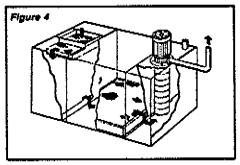
Figure 3: MTR32/45/64



PUMP TYPE	A (IN.)	B (IN.)
CRK2/4	1 ⅝"	1 ⅛"
CRK8/16	2.0"	1.0"
SPK1/2/4/8	1 ⅝"	1.0"
MTR32/45/64	2 ¾"	–

In general, it is recommended that the pump strainer be located as near as possible to the bottom of the tank. This maximizes first-stage submersion in condensate transfer applications and maintains fluid velocities in cutting lubricant applications (see Figure 4).

Figure 4



Separation of Particles

Out of consideration for the pump, the distribution system, the cutting tools and the treated materials, cooling/cutting fluids should, wherever possible, be free of particles before entering the pump unit. The system's requirements as to the purity of the pumped fluid depend on the machining methods, the treated materials and other criteria. Filtration methods should be matched to these requirements. Larger particles are unable to enter the pump with the pumped fluid due to the effect of the built-in inlet screen; particles Ø2 mm or smaller are allowed to enter the SPK and CRK pumps, and particles Ø4 mm or smaller are allowed to enter the MTR pump.

Bypass

A bypass line or pressure relief valve should be installed in the discharge pipe if there is any possibility the pump may operate against a closed valve in the discharge line (or in any other no-flow condition). Flow through the pump is required to ensure adequate cooling and lubrication of the pump is maintained. The following table shows minimum flow rates:

PUMP TYPE	MINIMUM FLOW RATE
SPK1	1.0 GPM
SPK2	1.2 GPM
SPK4	3.0 GPM
SPK8	5.3 GPM
CRK2	1.2 GPM
CRK4	3.0 GPM
CRK8	5.3 GPM
CRK 16	8.5 GPM
MTR 32	15 GPM up to 176°F (80°C) 35 GPM 176° - 194°F (80-70°C)
MTR45	20 GPM up to 176°F (80°C) 44 GPM 176° - 194°F
MTR64	28 GPM up to 176°F (80°C) 66 GPM 176°F - 194°F (80°C - 80°C)

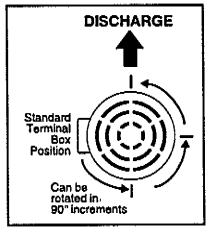
Operating The Pump

Position of Terminal Box

The motor terminal box can be turned to any of four positions in 90° steps. To rotate the terminal box, remove the four bolts securing the motor to the pump; turn the motor to the desired location; replace and securely tighten the four bolts.

Boiler Feed Installations

If the pump is being used as a boiler-feed pump, make sure the pump is capable of supplying sufficient water throughout its entire evaporation and pressure ranges. Where modulating control valves are used, a bypass around the pump must be installed to ensure pump lubrication.



Operating the Pump

Replacing The Motor

If the motor is damaged due to bearing failure, burning or electrical failure, the following instructions detail how to remove the motor for replacement. It must be emphasized that motors used on SPK/CRK/MTR pumps are specially selected to our rigid specifications. Replacement motors must be of the same frame size.

Removing the Old Motor

1. Remove the coupling guard screens.
2. Using the proper *metric* allen wrench, loosen the four cap screws in the coupling.
3. With the correct size wrench, loosen and remove the four bolts which hold the motor to the discharge section of the pump end.
4. Lift the motor straight up until the shaft is free from the coupling.

Installing the New Motor

1. Thoroughly clean the surfaces of the motor and pump end mounting flanges. Set the motor on the pump end.
2. Place the terminal box in the desired position by rotating the motor.
3. Insert the mounting bolts, then tighten diagonally and evenly.
4. Using a larger screwdriver, raise the pump shaft by placing the tip of the screwdriver under the coupling and carefully elevating the coupling to its highest point. Note: The shaft can only be raised approximately 0.20 inches (5 mm).
5. Now ***lower*** the shaft halfway back down the distance you just raised it (approximately the thickness of a dime), and retighten the *metric* cap screws in the coupling. Be sure to tighten the top and bottom screws on one side of the coupling and then the other. *Torque the coupling screws to the following specifications.*

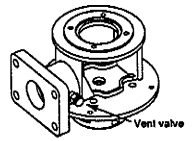
Coupling Bolt Size	Minimum Torque Specifications
M6	10 ft-lbs
M8	23 ft-lbs
M10	46 ft-lbs

6. Check to see that the gaps between the coupling halves are equal. Loosen and re-adjust if necessary.
7. Be certain the pump shaft can be rotated by hand. If the shaft cannot be rotated or it binds, disassemble and check for misalignment.
8. Replace the two coupling guard screens.

Starting The Pump The First Time

1. **Air Elimination**
As long as the pump body is partially submerged in fluid, the pump may be started against an open or a closed discharge line. If the discharge line is open, the air will quickly escape through the discharge pipe. If the discharge line is closed, the air will be pressed down through the pump body and out into the tank so that the discharge pressure will quickly reach its maximum (shutoff) level.

If the pump is fitted with a vent valve, this valve must be opened while running the pump against a closed valve. Once a steady stream of liquid is running out of this vent valve it can be closed.



2. **Check the Direction of Rotation**
   a. Switch the POWER OFF.
   b. Make sure the pump has been filled and vented.
   c. Remove the coupling guard and rotate the pump shaft to be certain it turns freely. Replace the coupling guard.
   d. Verify that the electrical connections are in accordance with the wiring diagram on the motor.
   e. Switch the power on and observe the direction of rotation. **When viewed from the top, the pump should rotate counter-clockwise.**
   f. To reverse the direction of rotation, first switch OFF the supply power.
   g. On three-phase motors, switch any two power leads at the load side of the starter. On single-phase motors, refer to the connection diagram on the nameplate. Change wiring as required.
   h. Switch the power ON and check for proper motor rotation.

Starting And Adjusting

Before starting the pump, make sure that:

1. The pump body is partially submerged in the fluid.
2. The direction of rotation is counter-clockwise when viewed from the top.
3. All piping connections are tight and the pipes are adequately supported.
4. The pump inlet screen is clean and unblocked.
5. Depending on the application, it may be necessary to start the pump against a closed discharge valve in order to prevent system damage due to water hammer. If so, this valve should be opened in a gradual manner after the pump is started. Unless used as a flow throttling device, make sure this valve is completely opened.
6. Check and record the voltage and amperage of the motor. Adjust the motor overloads if required.
7. Check and record operating pressures if pressure gauges have been installed.

Operating The Pump

8. Check all controls for proper operation. If pump is controlled by a pressure switch, check and adjust the cut-in and cut-out pressures. If low-water-level controls are used, be sure the low-level switch is properly adjusted so the pump cannot run if the pump should break suction.

Improper Operation

No Flow

Under no circumstances should the pump be operated for any prolonged periods of time without flow through the pump. This can result in motor and pump damage due to overheating. A properly sized relief valve should be installed to allow sufficient water to circulate through the pump to provide adequate cooling and lubrication of the pump bearings and seals.

Pump Cycling

Pump cycling should be checked to ensure the pump is not starting more than:

20 times per hour on 1/2 to 5 HP models
15 times per hour on 7 1/2 to 15 HP models
10 times per hour on 20 to 40 HP models

Rapid cycling is a major cause of premature motor failure due to increased heat buildup in the motor. If necessary, adjust controls to reduce the frequency of starts and stops.

Maintenance

Grundfos SPK/CRK/MTR multi-stage centrifugal pumps installed in accordance with these instructions and sized for correct performance will operate efficiently and provide years of service. The pumps are water-lubricated and do not require any external lubrication or inspection. The motors will require periodic lubrication as noted in the following paragraphs.

Motor Lubrication

Electric motors are pre-lubricated at the factory and do not require additional lubrication at start-up. Motors containing sealed bearings do not require additional lubrication during the first 15,000 hours of operation. Motors with grease fittings should **only** be lubricated with a lithium based grease.

Severity of Service	Ambient Temperature (Maximum)	Atmospheric Contamination	Approved Types of Grease	
Standard	104°F (40°C)	Clean, little corrosion	Shell Dolium R	Or compatible equivalent type of grease
Severe	122°F (50°C)	Moderate dirt, corrosion	Chevron SRI#2	
Extreme	>122°F (50°C) or Class H insulation	Severe dirt, abrasive dust, corrosion		

Lubrication Schedule

NEMA/(IEC) Frame Size	Standard Service Interval	Severe Service Interval	Extreme Service Interval	Weight of Grease to Add Oz./(Grams)	Volume of Grease to Add In³/(Teaspoons)
Up through 210 (132)	5500 hrs.	2750 hrs.	550 hrs.	0.30 (8.4)	0.6 (2)
Over 210 through 280 (180)	3600 hrs.	1800 hrs.	360 hrs.	0.61 (17.4)*	1.2 (3.9)
Over 280 up through 360 (225)	2200 hrs.	1100 hrs.	220 hrs.	0.81 (23.1)*	1.5 (5.2)
Over 360 (225)	2200 hrs.	1100 hrs.	220 hrs.	2.12 (60.0)*	4.1 (13.4)

*The grease outlet plug MUST be removed before adding new grease.

Do not over grease the bearings. Over greasing will cause increased bearing heat and can result in bearing/motor failure.

Periodic Safety Checks

At regular intervals depending on the conditions and time of operation, the following checks should be made:

1. Pump meets required performance and is operating smoothly and quietly.
2. There are no leaks, particularly at the shaft seal.
3. The motor is not overheating.
4. Remove and clean all strainers or filters in the system.
5. Verify the tripping of the motor overload protection.
6. Check the operating of all controls. Check unit control cycling twice and adjust if necessary.
7. If the pump is not operated for unusually long periods, the unit should be maintained in accordance with these instructions. In addition, if the pump is not drained, the pump shaft should be manually rotated or run for short periods of time at monthly intervals.

If the pump fails to operate or there is a loss of performance, refer to the Troubleshooting section on page 6.

* The information below was updated March 30, 2001, but is subject to change without notice. Grundfos makes no claims or warranties regarding the accuracy of the information herein.

Motors

Totally Enclosed Fan Cooled (TEFC) Baldor Motors*

60 HZ - Two Pole (3450 RPM)

HP	PH	SERVICE FACTOR	NEMA FRAME	VOLTS	AMPS FULL LOAD	AMPS LOCKED ROTOR/ START	S.F.	EFF.	POWER FACTOR	LINE TO LINE RESISTANCE AT 25 DEG C	INS. CLASS	KVA CODE	GRUNDFOS PART NO.
1/3	1	1.35	56C	115/230	2	24.5/12.2	7.6/3.8	55.0	68	6.489/7.172	B	K	85.680001
1/3	3	1.35	56C	208-230/460	1.5-1.4/.7	11-10/5	1.7-1.6/.8	70.0	65	38.2-42.3	B	K	85.580001
1/2	1	1.6	56C	115/208-230	7.4/4.1-3.7	36/19.8-18	9.8/5.2-4.9	62.0	69	3.382/3.738	B	K	85.700002
1/2	3	1.25	56C	208-230/460	2.1-2/1	12.4-11.3/5.6	2.6-2.4/1.2	68.0	63	34.06/37.64	B	J	85.600002
3/4	1	1.25	56C	115/208-230	9.8/5-4.8	51/28-25.5	11.4/6-5.7	66.0	74	2.332/2.578	B	K	85.700003
3/4	3	1.25	56C	208-230/460	2.7-2.6/1.3	33-30/15	3.1-3/1.5	74.0	73	23.4-25.86	B	K	85.600003
1	1	1.25	56C	115/230	11/5.5	77/38.5	14.4/7.2	66.0	81	2.347/2.594	B	K	85.700004
1	3	1.25	56C	208-230/460	3.7-3.6/1.8	24.3-22/11	4.1-4/2	75.5	76	15.9-17.5	B	H	85.600004
1 1/2	1	1.3	56C	115/208-230	17/9.5-8.6	79.8/43.8-39.9	20.4/11.3-10.2	71.0	79	1.178/1.302	B	K	85.700005
1 1/2	3	1.15	56C	208-230/460	5.0-4.6/2.3	35.4-32/16	3.3-3/2.5	75.5	76	11.2-12.3	B	G	85.600005
2	1	1.15	56C	115/230	23/11.5	158.4/79.2	25.4/12.7	74.0	82	0.872	F	K	85.700006
2	3	1.15	56C	208-230/460	5.7-5.4/2.7	38.7-35/17.5	6.3-6/3	78.5	93	10.7-11.8	B	H	85.600006
3	1	1.15	56C	115/208-230	30/16.5-15	172/95.1-86	32.2/16.1	77.0	87	0.593	F	H	84.6346075
3	3	1.15	56C	208-230/460	7.8-7.4/3.7	59.7-54/27	***	82.5	87	5.5-6.1	F	J	84.6326074
3	1	1.15	182TC	115/208-230	29/16-14.5	170/93.5-85	32.8/18-16.4	75.0	88	.569/.629	F	H	85.700008
3	3	1.15	182TC	208-230/460	8.2-7.8/3.9	77.4-70/35	9-8.6/.3	81.5	89	4.9-5.4	F	K	85.600008
5	1	1.15	213TC	230	22	170	25	80.0	89	0.29	F	J	85.700012
5	3	1.15	184TC	208-230/460	13.2-12/6	103.9-94/47	15-13.6/6.8	85.5	93	2.6-2.9	F	K	85.600012
7 1/2	1	1.15	213TC	208-230	34.3-31	240-217	39.3-35.5	82.0	91	.2109/.2331	H	F	85.700017
7 1/2	3	1.15	213TC	208-230/460	19-17.2/8.6	168.1-152/76	21.7-19.6/9.8	87.5	94	1.4-1.5	F	L	85.600017
10	1	1.15	213TC	230	40	233.5	46	85.5	97	***	F	F	85.700022
10	3	1.15	215TC	208-230/460	25-24/12	232.2-210/105	28.3-27.2/13.6	85.5	91	1.07-1.18	F	J	85.600022
15	3	1.15	254TC	208-230/460	38-34/17	376-340/170	43.4-38.8/19.4	86.5	94	.62-.69	H	L	85.600024
20	3	1.15	254TC	230/460	46/23	420/210	52.4/26.2	88.5	92	0.36	F	K	85.600035
25	3	1.15	284TSC	208-230/460	61-58/29	482.1-436/218	70-66/33	91.0	89	.30-.33	F	H	85.600026
30	3	1.15	286TSC	230/460	72/36	444/222	80/40	88.5	88	0.319	F	G	85.600027
40	3	1.15	286TSC	230/460	94/47	580/290	105.2/52.5	90.2	89	0.176	F	***	85.600032

*** Information unavailable at time of update.

Open Drip Proof (ODP) Baldor Motors*

60 HZ - Two Pole (3450 RPM)

HP	PH	SERVICE FACTOR	NEMA FRAME	VOLTS	AMPS FULL LOAD	AMPS LOCKED ROTOR/ START	S.F.	EFF.	POWER FACTOR	LINE TO LINE RESISTANCE AT 25 DEG C	INS. CLASS	KVA CODE	GRUNDFOS PART NO.
1/3	1	1.35	56C	115-230	5-3	28-14	7-3.5	55.0	68	7.12	B	K	84.Z00023
1/3	3	1.35	56C	208-230/460	1.5-1.4/.7	20-10/5	1.7-1.6/.8	70.0	65	38.20-42.3	B	J	85.600001
1/2	1	1.25	56C	115/208-230	7.2/4-3.6	39/19.5-18	9/4.4-4	66.0	66	4.72	B	H	84.Z00024
1/2	3	1.25	56C	208-230/460	2.1-2/1	13.2/7-12/6	2.6-2.4/1.2	68.0	63	35.1	B	J	84.Z00001
3/4	1	1.25	56C	115/208-230	9.6/5.3-4.8	50/30.86-26	11.4/6.3-5.7	66.0	74	2.5	B	K	84.Z00025
3/4	3	1.25	56C	208-230/460	9.6-5.3/4.8	16.81-15.2/7.6	3.1-3/1.5	74.0	73	24.9	B	K	84.Z00003
1	1	1.25	56C	115/208-230	14/7.3-7	92/50.87-46	16/8.8-8	65.0	85	1.83	B	L	84.Z00026
1	3	1.25	56C	208-230/460	3.3-3/1.5	24.33-22/11	4.2-3.8/1.9	75.5	76	10.7	B	H	84.Z00005
1 1/2	1	1.15	56C	115/208-230	19/8.7-8.0	120.8/66.5-60.4	19.6/10.8-9.8	68.0	77	1.24	B	G	84.Z00027
1 1/2	3	1.15	56C	208-230/460	4.8-4.6/2.3	40.7-36.8/18.4	5.3-5/2.5	80.0	74	8.53	B	K	84.Z00007
2	1	1.15	56C	115/208-230	24/12	160/88.5-80	26/13	70.0	75	0.844	B	G	84.Z00028
2	3	1.15	56C	208-230/460	5.9-5.6/2.8	77.4-70.4/35.2	6.5-6.2/3.1	81.5	89	10.7	B	H	84.Z00009
3	1	1.15	56C	230	13	106	14.6	82.5	90	0.614	B	K	84.6246075
3	3	1.15	56C	208-230/460	8.4-8/4	66.35-60/30	9.5-9/4.5	82.5	89	5.6	B	J	84.6226075
3	1	1.15	182TC	115/208-230	29/14.7-14	148/81.83-74	32/18.3-16	78.0	88	0.176	B	G	84.Z00029
3	3	1.15	182TC	208-230/460	8.4-8/4	66.35-60/30	9.5-9/4.5	82.5	89	5.6	B	J	84.Z00011
5	1	1.15	213TC	208-230	28-26	167.2-152	31-28.7	78.0	82	.3259/.3602	B	G	84.Z00030
5	3	1.15	184TCZ	208-230/460	13-12/6	137.6-124.8/62.3	14.7-13.6/6.8	87.5	90	2.83	B	L	84.Z00013
7 1/2	1	1.15	213TC	208-230	38-37	212.3-192	42-41	81.0	82	0.23	B	G	84.Z00031
7 1/2	3	1.15	215TC	208-230/460	19-18/9	168.1-152/76	21-20/10	85.5	91	2	B	J	84.Z00015
10	1	1.15	215TC	230	48	280	51.7	83.0	86	0.163	B	G	84.Z00032
10	3	1.15	215TC	208-230/460	27-25/13	195.5-176.9/88.4	30-29/14	85.5	91	1.47	B	H	84.Z00017
15	3	1.15	254TC	208-230/460	38-36/18	289.7-262/131	45.4/20.5	85.5	92	0.961	F	G	84.Z00019
20	3	1.15	254TC	230/460	***	***	***	***	***	***	***	***	84.Z00374
25	3	1.15	284TSC	230/460	59/29.5	372/186	67/33.5	92.4	88	0.488	B	G	84.Z00021
30	3	1.15	284TSC	230/460	70/36.5	422/216	81.2/40.6	90.2	86	.3373/.3728	F	G	84.Z00022
40	3	1.15	286TSC	230/460	100/50	540/270	114.04/57.02	90.2	93	.1919/.2121	B	F	84.Z00033

*** Information unavailable at time of update.

IEC IP55, IM 3611 (V18)*

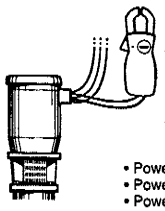
60 HZ - Two Pole (3450 RPM)

Kw	HP	PH	S.F.	VOLTS	AMPERAGE FULL LOAD	AMPERAGE LOCKED ROTOR	FULL LOAD EFF.	POWER FACTOR	LINE TO LINE RESISTANCE	INS. CLASS	GRUNDFOS PART NO.
0.25	1/3	3	1.0	220-255/380-440	1.10-1.02/0.63-0.59	6.1-7.1/3.5-4.1	73/73	0.86/0.77	23.5	F	85.105501
0.37	1/2	3	1.0	220-255/380-440	1.50-1.44/0.87-0.83	8.3-9.4/4.8-5.4	78/79	0.85/0.76	21.2	F	85.805102
0.55	3/4	3	1.0	220-255/380-440	2.15-2.05/1.25-1.20	10.8-12.3/6.3-7.2	80.5/82	0.85/0.76	14.8	F	85.805103
0.75	1	3	1.0	220-255/380-440	2.85-2.70/1.65-1.55	17.1-18.9/9.9-10.9	82/84	0.85/0.78	10.4	F	85.805104
1.1	1 1/2	3	1.0	220-255/380-440	4.15-3.80/2.40-2.20	24.5-27.7/14.1-6.1	82/85	0.86/0.80	6.85	F	85.805105
1.5	2	3	1.0	220-277/380-480	5.70-5.00/3.30-2.90	33.6-42.0/19.5-24.4	80.5/82	0.89/0.78	3.8	F	85.805906
2.2	3	3	1.0	220-277/380-480	8.05-6.95/4.65-4.00	52.3-66.0/31.0-38.0	83/84.5	0.90/0.81	2.5	F	85.805908
3	4	3	1.0	220-277/380-480	10.6-9.00/6.10-5.20	78.4-99.0/45.1-57.2	86/87	0.90/0.83	1.74	F	85.805810
4	5.5	3	1.0	220-277/380-480	13.6-11.4/7.85-6.60	109-137/63-79	87/88	0.92/0.85	1.64	F	85.805413
5.5	7 1/2	3	1.0	220-277/380-480	18.8-15.6/10.8-9.00	154-193/89-112	87.5/89.5	0.92/0.85	1.12	F	85.807417
7.5	10	3	1.0	220-277/380-480	25.5-22.6/14.8-13.0	242-262/139-151	88.5/90	0.92/0.80	0.685	F	85.807422
11	15	3	1.0	220-277/380-480	37.0-30.2/21.4-17.4	244-290/141-167	89/91	0.90/0.86	.3711	F	85.807424

Troubleshooting

Preliminary Checks

Supply Voltage



How to Measure
Use a volt meter, (set to the proper scale) measure the voltage at the pump terminal box or starter.

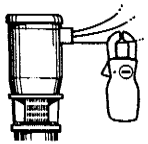
On single-phase units, measure between power leads L1 and L2 (or L1 and N for 115 volt units). On three-phase units, measure between:

- Power leads L1 and L2
- Power leads L2 and L3
- Power leads L3 and L1

What it Means
When the motor is under load, the voltage should be within ±10% of the nameplate voltage. Larger voltage variation may cause winding damage and indicate a poor electrical supply. The pump should not be operated until these variations have been corrected.

If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

Current Measurement



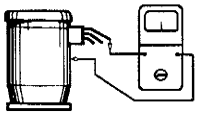
How to Measure
Use an ammeter, (set on the proper scale) to measure the current on each power lead at the terminal box or starter.

Current should be measured when the pump is operating at constant discharge pressure.

What it Means
If the amp draw exceeds the listed service factor amps (SFA) or if the current imbalance is greater than 5% between each leg on three-phase units, check the following:

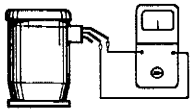
1. Burned contacts on motor starter.
2. Loose terminals in starter/terminal box or possible wire defect.
3. Too high or too low supply voltage.
4. Motor windings are shorted or grounded. Check winding and insulation resistances.
5. Pump is damaged causing a motor overload.

Lead-To-Ground Resistance



How to Measure
Turn off power and disconnect the supply power leads in the pump terminal box. Using an ohmmeter, set the scale selector to R x 100 and zero adjust the meter by touching the two ohmmeter leads together. Touch one ohmmeter lead to a motor lead and one to ground. Repeat for each lead. If measured resistance does not exceed 1,000,000 ohms, motor is bad and in need of replacement.

Winding Resistance



How to Measure — NEMA
Turn off power and disconnect the supply power leads in the pump terminal box. Using an ohmmeter, set the scale selector to R x 1 and zero adjust the meter by touching the two ohmmeter leads together.

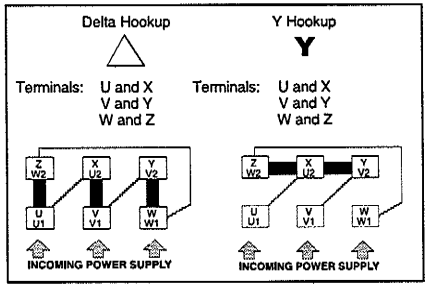
Touch the leads of the ohmmeter to two motor leads.

Single phase motors - touching the leads of the ohmmeter to the two outgoing "hot" motor leads (either a single motor lead or combination of leads joined together) will measure the main winding's resistance.

Three phase motors - touching the leads of the ohmmeter to any two hot leads will measure that winding's resistance. Repeat for all three possible lead combinations (L_1 and L_2, L_2 and L_3, L_1 and L_3)

How to Measure — IEC
Turn off power and disconnect the supply power leads in the pump terminal box. Using an ohmmeter, set the scale selector to R x 1 and zero adjust the meter by touching the two ohmmeter leads together.

Touch the leads of the ohmmeter to two motor terminals as follows:



What it Means
If all ohm values are normal, the motor windings are neither shorted nor open. If any one ohm value is less than normal (-25%), that motor winding may be starting to short. If any one ohm value is greater than normal (+25%), the winding may be starting to open. If some values are high and some are low, the leads may be connected incorrectly, or they may have a break in the insulating jacket.

Diagnosing Specific Problems

The following checklist should help you troubleshoot most of the problems you may encounter during installation.

If The Pump...	*It May Be Caused By...*	*Check This By..*	*Correct It By...*
Does Not Run	No power at pump panel	Check for voltage at panel	If no voltage at pump panel, check feeder panel for tripped circuits
	Fuses are blown or circuit breakers are tripped	Turn off power and remove fuses. Check for continuity with ohmmeter	Replace blown fuses or reset circuit breaker. If new fuses blow or circuit breaker trips, the electrical installation, motor and wires must be checked.
	Motor starter overloads are burned or have tripped out	Check for voltage on line and load side of starter	Replace burned heaters or reset. Inspect starter for other damage. If heater trips again, check the supply voltage and starter holding coil.
	Starter does not energize	Energize control circuit and check for voltage at the holding coil	If no voltage, check control circuit fuses. If voltage, check holding coil for shorts. Replace bad coil.
	Defective controls	Check all safety and pressure switches for operation. Inspect contacts in control devices	Replace worn or defective parts or controls
	Motor is defective	Turn off power and disconnect wiring. Measure the lead to lead resistances with ohmmeter (RX-1). Measure lead to ground values with ohmmeter (RX-100K). Record measured values	If an open or grounded winding is found, remove motor and repair or replace
	Defective capacitor. (Single-phase motors)	Turn off power and discharge capacitor. Check with ohmmeter (RX-100K).	When the meter is connected to the capacitor, the needle should jump towards 0 ohms and slowly drift back to infinity (∞). Replace if defective
	Pump is bound	Turn off power and manually rotate pump shaft	If shaft does not rotate easily, check coupling setting and adjust as necessary. If shaft rotation is still tight, remove pump and inspect. Disassemble and repair
			Correct wiring
Pump Runs But At Reduced Capacity or Does Not Deliver Water	Wrong rotation	Check wiring for proper connections	Provide submergence by increasing fluid level in tank or sump; alternatively by repositioning pump at lower level
	Pump body not partially submerged	Turn pump off, close isolation valve(s). Check fluid level	Clean and replace strainer, screen and/or valves
	Strainers, inlet screen or valves are clogged	Remove strainer, screen or valve and inspect	Install baffle(s) in tank. Relocate inlet pipe. Decrease pump flow rate
	Entrained air in pumpage	Check tank conditions for cascading fluid or vortexing	Decrease pump flow rate and/or fluid temperature. Increase first-stage submersion
	Fluid cavitating	Compare pump NPSH requirements to available NPSH at pump flow rate	Convert measured pressure (in PSI) to head (in feet): (Measured PSI x 2.31 ft/PSI = _____ ft.) Refer to the specific pump curve for shutoff head for that pump model. If head is close to curve, pump is probably OK. If not, remove pump and inspect
	Pump worn	Install pressure gauge, start pump, gradually close the discharge valve and read pressure at shutoff	Remove any foreign materials found
	Pump impeller or guide vane is clogged	Disassemble and inspect pump passageways	If voltage varies more than ±10%, contact power company. Check wire sizing
Fuses Blow or Circuit Breakers or Overload Relays Trip	Low voltage	Check voltage at starter panel and motor	Increase heater size or adjust trip setting to a maximum of motor nameplate (full load) current
	Motor overloads are set too low	Cycle pump and measure amperage	Must be within ±5%. If not, check motor and wiring. Rotating all leads may eliminate this problem
	Three-phase current is imbalanced	Check current draw on each lead to the motor	
	Motor is shorted or grounded	Turn off power and disconnect wiring. Measure the lead-to-lead resistance with an ohmmeter (RX-1). Measure lead-to-ground values with an ohmmeter (RX-100K) or a megaohm meter. Record values	If an open or grounded winding is found, remove the motor, repair and/or replace
	Wiring or connections are faulty	Check proper wiring and loose terminals	Tighten loose terminals. Replace damaged wire
	Pump is bound	Turn of power and manually rotate pump shaft	If shaft does not rotate eaily, check coupling setting and adjust as necessary. If shaft rotation is still tight, remove pump and inspect. Disassemble and repair
	Defective capacitor. (Single-phase motors)	Turn off power and discharge capacitor. Check with ohmmeter (RX-100K)	When the meter is connected to the capacitor, the needle should jump towards 0 ohms and slowly drift back to infinity (∞). Replace if defective.
	Motor overloads at higher ambient temperature than motor	Use a thermometer to check the ambient temperature near the overloads and motor. Record these values	If ambient temperature at motor is lower than at overloads, especially where temperature at overloads is above 104°F (40°C), ambient-compensated heaters should replace standard heaters

Notes

Notes

D. INSTALLATIONS OF LIKE PROJECTS

Hydrotech Filtration Reference List

Please note: the information contained in this document is CONFIDENTIAL. This should not be reproduced, distributed, etc. without the express written consent of Kruger, Inc.

Project Name	Address	Contact	Phone	Engineer	Contractor	Flowrate (MGD)	Application	Installed/ Startup
Moncks Corner (Bard), SC		Louis Mintz	843-761-8300	RMT, Inc.	Owner's Contractor	0.46	latex facility (industrial WWTP)	2005
Hastings WWTP, FL		Joey Lundquist	904-692-1520	Mittauer & Assoicates	Mack Concrete Industries	0.60	Tertiary filtration, chlorine disinfection	2002
Baldwin CDBG WWTP, FL	800 Main Street Baldwin, FL 32234	Don Casey	904-266-9055	Mittauer & Associates	Meadors Construction Co., Inc.	0.80	Tertiary filtration/Reuse	2004
Eagle Ridge, FL		Tony Wierzbicki	407-869-1919	CPH Engineers, Inc.	Utilities, Inc. of Eagle Ridge	1.00	Tertiary filtration	2005
Carey Station, GA	4310 North Carey Station Road Greensboro, GA 30642	Bob Sheldon	888-429-3794	HSF Engineering, Inc.	Southern Champion Construction, Inc.	1.25	Tertiary filtration/Reuse	2004
Oconee Crossings WTP - Greensboro, GA		Bob Sheldon	888-429-3794	HSF Engineering, Inc.	Southern Champion Construction, Inc.	1.25	Tertiary filtration/Reuse, UV disinfection	2002
Palatka WWTP	3010 Brown's Landing Road Palatka, FL 32177	Drew Platt	386-329-0146	Hartman & Associates	Meadors Construction Co., Inc.	1.75	Tertiary Filtration	2004
Village of Marissa WTF - Marissa, IL		William Yates	618-295-2018	Unavailable	Unavailable	3.73	Tertiary filtration, no disinfection	2002
Marburg (Winder), GA		Leslie Harbin	770-867-4334	HSF Engineering, Inc.	Southern Champion Construction, Inc.	3.75	Tertiary Filtration	2005
City of Mesquite, NV		Bill Tanner	702-346-5237	Stantec Consulting	Owner's Contractor	4.00	Tertiary filtration, UV disinfection	2002
Alamogordo WWTP, NM		Cheryl Richardson	505-439-1606	USFilter Engineering & Construction	USFilter Engineering & Construction	4.00	Tertiary filtration/reuse	2002
N.E. Brunswick County, NC		Michael Painter	910-279-5249	W.K. Dickson & Co., Inc.	T.A. Loving	4.13	Tertiary filtration	2003

E. MANUFACTURER'S REPRESENTATIVE INFO

STEVE GARNICK
MISCO WATER
sgarnick@miscowater.com
5976 W. Las Positas Blvd. #226
Pleasanton, CA 94588
Phone: 925-225-1900
Fax: 925-225-9200

F. CONSTRUCTION METHODS

3 DELIVERY AND INSTALLATION

3.1 Delivery

Kruger will coordinate shipping of the Discfilter to the job site. Prior to arrival, the contractor should review the submittal information for the weight of each Discfilter and verify adequate equipment capacity is available for unloading. Upon arrival, inspect each unit for damage due to shipping. Notify the Kruger Project Manager immediately of any damage noted.

For safe transport it is sometimes necessary to deliver some parts unmounted. Spare parts will typically be shipped attached or inside the equipment. Be sure to check all parts against the packing list. Handle fragile parts (such as filter panels) with care to avoid damage.

3.2 Storage

If it is necessary to store the equipment for periods longer than a few days prior to installation, then certain precautions should be taken to prevent unnecessary damage:

- Preferably, the units should be stored inside with temperature above freezing.
- The filter media must be protected from direct sunlight and UV exposure. The covers for the unit must be kept in place during storage. For –2F type units, the filter media are exposed below the top of the frame. Protective wrapping or tarping must be kept in place to prevent exposure to sunlight.
- Spare filter panels must be stored to prevent exposure to sunlight due to the potential for deterioration. Spare panels should also be stored to prevent puncturing.

3.3 Lifting

- Discfilters with tank (type 1F) may be lifted by a forklift or by using a crane and straps. See Figure 3.1 for lifting locations if using straps. Discfilters without tank (type –2F) may be lifted with a crane and straps. See Figure 3.2 for lifting locations.
- Note that lifting eyes have an approximate 1-1/2" to 2" diameter hole.

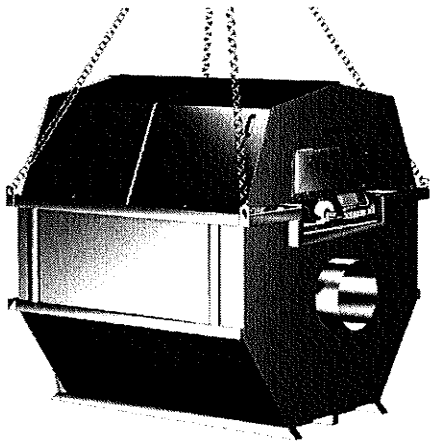


Figure 3.1.
Lifting points, Type 1F

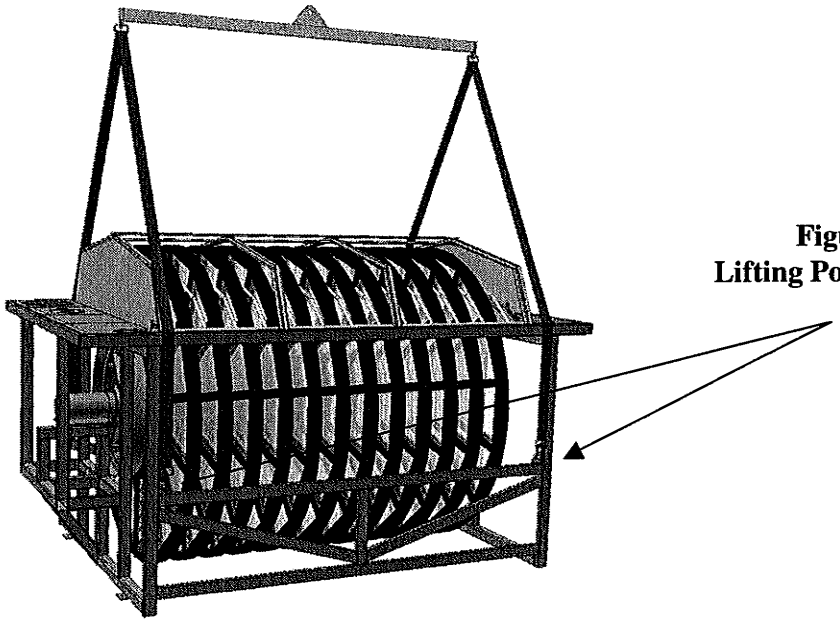


Figure 3.2.
Lifting Points, Type 2F

3.4 Foundation

- Filter must be mounted on even surface with appropriate torsional and structural strength.
- The filter must be properly leveled in both directions (See Figure 3.3).
- Foundation/anchor bolts are required. The filter should be set in place to use as a template for anchor installation.
- A minimum of 24" (600mm) should be available around the filter to allow for maintenance. Elevated walkways are recommended in order to easily access the backwash header and filter media for service. However, walkways should NOT be attached or supported by the discfilter!

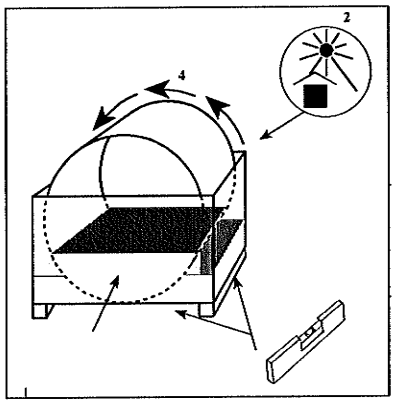


Figure 3.3. Filter installation

3.5 Installation

- The filter should only be installed if the equipment is not damaged from transport or storage and all preparatory work is completed.
- Electrical specifications of the equipment must correspond to the available line current specifications.
- It is necessary to protect the filter from direct sunlight with outdoor installations as the heat and UV-radiation may otherwise destroy the filter elements.
- Upon placement, place a tarp or other cover over each unit until surrounding concrete work is complete. This is to protect from splashed concrete, dirt, or other materials.
- Protect the filter from freezing. At water temperatures of +5 °C (41 °F) and an air temperature warmer than –10 °C (14 °F), the lids and unit cover will be sufficient to protect it from freezing. At lower water and air temperatures, install the filter indoors.

3.6 Emergency by-pass

Type 1F (with tank) Discfilters have a built-in emergency by-pass weir as standard. The bypassed water mixes with the filtered effluent, but avoids overflow of the unit during upset conditions (e.g. a power failure, excess flow, or excess solids loading). It is advantageous to have a separate by-pass chamber and flange provided with the unit to avoid excessive water level pressure over the filter cloth. A separate by-pass also provides the benefit of preventing untreated water from entering the filtered water basin/tank. For high-flow rate designs an external means of bypass may also be required.

For a type 2F Discfilter (without tank), the inlet box may be used as the emergency by-pass means. The bypassed water mixes with the filtered effluent, but avoids overflow of the unit during upset conditions. In the case of type 2F units, it is advantageous to have an external by-pass arranged to avoid excessive water level pressure over the filter cloth and prevent untreated water from entering the filtered water basin/tank.

Reference the drawings provided in Section 3 of the O&M Manual along with site construction drawings to determine whether a separate/external bypass is included in the design.

3.7 Drum and Backwash pump motor rotation

A gear motor with a belt drive rotates the Discfilter for the 2200 model. Rotation speed can be altered using the frequency converter (VFD) installed in the control cabinet. Direction of rotation is marked on the motor cover. Verify proper motor rotation. Proper rotation for the Backwash Pump motor must also be verified.

3.8 Disc and Inlet drum assembly positioning

The filter unit may be exposed to shock during transportation and/or installation. The drum level should be inspected and verified after completed installation. Contact Kruger personnel immediately if there is any evidence of misalignment.

3.9 Electrical

Electrical connection shall be performed according to local regulations. Check the settings of motor protectors against amperage readings on the motors. Note that it is critical that the level sensor have an adequate ground for proper operation. If the level sensor is not operating properly, it may be necessary to verify that the grounding point for the sensor is adequate.

3.10 Pipe connections

Nominal pipe sizes are indicated in the Technical specifications at Section 1 of the O&M Manual. Inlet water velocity should not exceed 1 m/s (3.28 ft/s) to avoid turbulence inside the drum unit.

Piping from the backwash sludge connection must have an inclination of at least 1% to avoid solids settling in the piping.

3.11 Backwash system

The backwash pump will be delivered to the site separately from the Discfilter. Install the pump in the location as shown on the drawings. Mounting holes and supports are supplied on the unit for the pump to be bolted and connected. The pump will then require connection to the piping.

Any particles in the backwash water supply area (the filtered water tank/basin) must be removed in order to prevent clogging of the backwash nozzles or damage to the pump and/or filter media. Be certain that any debris or particles are cleaned from the tank/basin prior to filling with water. A simple in-line strainer is typically provided in the backwash piping in order to remove particles from the backwash system.

DISCFILTER PROCESS

CONTRACTOR BRIEFING FOLDER

Contractor Briefing Folder

Table of Contents

1. Purpose

The purpose of this document is to provide an overview of Kruger's scope of supply and services for this project and to summarize the responsibilities of both the Contractor and Kruger in the prosecution of the work.

It has been Kruger's experience that many of the problems experienced during project execution can be minimized when the Contractor's personnel are fully aware of the scope of work Kruger is contracted to supply and what the Contractor's obligations are pertaining to Kruger's involvement in the project.

This briefing folder has been prepared with a focus on those areas that have sometimes caused difficulties in earlier projects. Our intent in providing this document is to alert all parties to the project elements and communication that will facilitate efficient construction and successful project completion.

2. Kruger Responsibilities

This section of the briefing folder provides a statement of Kruger's scope of supply for this project. In addition to the equipment we are providing, this section also provides a summary of our installation inspection and start-up services for this project.

2 a. Scope of Supply

Kruger is responsible for the supply of equipment and services as detailed in the Engineer's contract specifications to the extent included in our Contract Agreement with the Contractor or Owner. Installation of the Kruger supplied equipment is the responsibility of the Contractor.

2 b. Shipping

Most of the material for this project will be drop shipped from a Kruger authorized supplier and delivered directly to the site. The authorized supplier has been informed to follow the following instructions:

- All items delivered will be clearly identified with Kruger's name, Kruger's project name, Kruger's project number and the Contractor's/Owner's purchase order/contract number to Kruger

- All shipments will have a clear Packing List identifying all parts in the shipment. There should not be any Packing List with " 1 lot Machine Parts". The Packing List description will be descriptive.

- All boxes will be identified with a Packing List clearly identifying all the contents of each box.

- All equipment will be tagged with the corresponding tag numbers shown on the design drawings (if applicable).

- The shipper is required to call the jobsite 48 hours in advance of delivery, and make arrangements with the contractor for delivery of the shipment.

If there are more stringent requirements in the contract documents then they will take precedence over the above. If any of these requirements are not being followed, please notify the Kruger Project Manager immediately. The project manager will work with our suppliers to ensure the problem does not continue.

2 c. Installation Instructions

Kruger will supply specific Installation Manuals for equipment manufactured by Kruger. These manuals will be provided to the Contractor prior to delivery of the equipment. For equipment **not** manufactured by **Kruger**, refer to appropriate section in the Installation, Operation and Maintenance Manual to determine the manufacturer's installation requirements.

2 d. Installation Inspection Services

When the Contractor has completed installation of all the Kruger supplied equipment for this project, Kruger will schedule qualified field service personnel to review the installation upon receipt of the completed Contractor Pre-operational Checkout Checklist (Form CPO – 4). This checklist is included under Tab 7 of this briefing folder.

When the Pre-Operational Checkout of the equipment has been completed by the Kruger field service personnel, and the Contractor has sent a completed Contractor Functional (Process) Start-Up Checklist (Form CFS – 4), Kruger will schedule the appropriate field service personnel to conduct the Functional (Process) Start-Up Checkout. The Contractor Functional (Process) Start-Up Checklist is included under Tab 7 of this briefing folder.

2 e. Start-up Services

Kruger's Functional (Process) Start-Up services include making final preparations for equipment operation and includes process optimization service to achieve specified effluent limits from the Kruger systems.

3. Contractor Responsibilities

This section of the briefing folder provides a summary of the Contractor's scope of work for this project pertaining to the Kruger supplied equipment.

3 a. Receiving of Equipment

The Contractor is responsible for receiving and unloading of Kruger supplied equipment at the jobsite or designated delivery address. Kruger will instruct the trucking companies to comply with site delivery constraints and notices required by our agreement with the Contractor or Owner. Upon delivery to the site, the shipment should be inspected for missing parts and damage sustained in transit. Damaged and/or missing parts are to be noted and reported to the carrier and the Kruger Project Manager. The Contractor is responsible for promptly notifying the Kruger Project Manager within 2 working days if any of our shipments are received in damaged condition or are missing parts. This procedure will protect all parties until the responsibility for the damages or shortages is determined. Copies of delivery tickets must be mailed or faxed to the Kruger Project Manager upon receipt of our equipment at the jobsite.

3 b. Storage of Equipment

The Contractor is responsible for storage and protection of Kruger supplied equipment upon delivery to the jobsite. Once the equipment has been checked for damages and/or shortages, use the following guidelines if it is intended to store the equipment.

Preferably all equipment should be warehoused to protect the equipment against inclement weather, dirt, physical damage and theft. **Spare parts should also be warehoused until turned over to the plant personnel.** When indoor storage is not available then outdoor storage is acceptable. In either case the following procedure should be followed:

- All equipment should be stored in a clean and dry area that provides adequate ventilation. All equipment must be stored with adequate support underneath to prevent distortion and to avoid any undesirable ground or floor conditions. Any tenting or tarpaulins must be well supported so to provide adequate ventilation.

- Recoat any parts with paint, primer or grease, which has been scratched or wiped clean of their protective coating during shipment or delivery. Periodic checking is necessary to remove any accumulated condensation or rust and to recoat as necessary.

- Mechanical equipment with rotating components i.e. motors, gear drives, etc. shall have the component shafts hand rotated several times on a regular basis.

For equipment **not** manufactured by **Kruger,** refer to the appropriate section in the Installation, Operation and Maintenance Manual to determine the manufacturer's storage requirements.

3 c. Equipment Installation

The Contractor is responsible for installation of Kruger supplied equipment in accordance with the installation instructions.

The Contractor is responsible for proper protection of the equipment during and after installation until this responsibility is taken over by the Owner. This includes covering or wrapping equipment to protect it from water or dust infiltration during the course of installation or construction. Special attention should be paid to ensure that equipment is adequately protected from adjacent construction activity such as welding, concrete finishing, etc. Open conduit or junctions boxes must be covered to ensure that water cannot enter or damage equipment.

The Contractor is responsible for the installation of field electrical and control wiring, including terminations, for all Kruger equipment and control panels. This includes verification that wiring has been correctly installed and terminated prior to requesting Kruger installation inspection services.

The Contractor is responsible for supplying and installing of lubricants in accordance with the manufacturer's recommendations.

3 d. Requests for Inspection Services

Kruger will provide installation inspection services for Kruger supplied equipment and/or systems as required by our purchase agreement with the Contractor. It is the Contractor's responsibility to ensure that all Kruger supplied equipment is installed prior to Kruger's inspection visit. With some installations, a separate Kruger inspection may be required prior to grouting Kruger supplied equipment. It is the Contractor's responsibility to ensure that Kruger inspects and approves the installation prior to addition of the required grout.

Kruger requests a minimum of three weeks notice to schedule installation inspection services, therefore it is essential that the Contractor notify our Project Manager at least three weeks before our personnel are needed on site. Upon receipt of this notice, Kruger's Field Service Manager will schedule our personnel. **However, no Kruger personnel will be dispatched to the jobsite until Kruger receives the**

completed Pre-Operational Checkout Checklist from the Contractor certifying that the work is complete and ready for Kruger's visit.

If site readiness requires rescheduling of Kruger's installation or startup visits after the Contractor's formal request, it is the Contractor's responsibility to promptly notify Kruger of the new schedule. Kruger will make every effort to accommodate schedule delays but cannot guarantee availability of installation inspection or startup personnel with less than three week's advance notice.

Sometimes when Kruger personnel arrive on the jobsite as scheduled, we discover that work the Contractor has certified as complete is not yet finished. This causes additional costs and delays and may require additional visits. The Contractor is responsible for any additional costs Kruger incurs as a result.

3 e. Contractor Checklists

Included under Tab 7 of this Briefing Folder are standard Kruger Checklist Forms to be completed by the Contractor and returned to Kruger's Project Manager prior to performance of Kruger's onsite installation inspection services. Kruger will schedule our field service visits prior to return of completed checklists but it is Kruger policy to not dispatch field personnel to the jobsite until the completed and signed checklist is received by our Project Manager or Field Service Manager.

NOTICE: Kruger policy does not allow Kruger service personnel to perform installation inspections or field start-up until applicable checklist is completed and returned by the Contractor.

4. Start-Up Planning

In order for equipment checkout and start-up activities to proceed in an efficient manner, it is essential that the necessary preparatory work is complete prior to Kruger personnel arriving on site. The Contractor, Owner, Engineer, and Kruger should have a common understanding of the activities to be performed on-site and the role each must play.

The Kruger Start-Up Plan for Discfilters consists of two (2) phases. The Pre-Operational Checkout phase is conducted prior to putting the equipment and/or systems on line. The second phase is the Functional (Process) Start-Up phase which occurs when the equipment and/or system is put on line.

The Pre-Operational Checkout is a dry checkout of the equipment; water cannot be in the basins or tanks. During this checkout the installation of the equipment is closely inspected for any problems. At this time Kruger will notify the Contractor of any incomplete work or deficiencies. It is Kruger's policy that field service personnel cannot be dispatched back to the jobsite until we receive the Contractor's confirmation that identified incomplete work or deficiencies have been completed or resolved.

The Functional (Process) Start-Up is when the treatment process is put on line with influent coming into the process and effluent being discharged from the process. Kruger will make the final preparations for equipment operation and will help the operators to optimize the process performance and conduct maintenance and process training during this phase. At this time Kruger considers the facility to be getting beneficial use of the equipment and/or process and the warranty requirements shall apply.

Kruger recommends that a start-up planning conference call involving the Contractor, Owner, Engineer, and Kruger be held approximately 6 to 8 weeks before the Contractor's scheduled process start-up date.

Work that must be completed prior to Kruger's Pre-Operational Checkout visit includes:

- Installation of all Kruger supplied equipment
- Installation and termination of interconnecting wiring between MCCs, control panels, and field instruments for all equipment supplied by Kruger
- Lubrication of all Kruger supplied equipment
- Installation of permanent power to all Kruger supplied equipment.

Work that must be completed prior to Kruger's Functional (Process) Start-Up Checkout visit includes:

- Installation and termination of interconnecting wiring between MCCs, control panels, and field instruments for all equipment that Kruger must communicate with or control
- Removal of all construction debris and flushing of pipelines, etc.
- Installation, operational checkout and wet testing of all upstream and downstream systems necessary to provide inflow to Kruger's system and to handle discharge flows from Kruger's system.
- Installation, operational checkout and wet testing of equipment or systems that are not supplied by Kruger but must be operational to allow completion of Kruger process start-up.
- Identification of the personnel operating the plant during the process start-up and their responsibilities during this phase.
- Scheduling of the training sessions for both maintenance and process training.
- Confirmation of chemicals, power and influent water available to put process on line.

5.Contact Information

Project Manager: Refer to Letter of Introduction
Address: I. Kruger, Inc.
401 Harrison Oaks Blvd.
Suite 100
Cary, NC 27513

Phone: (919) 677-8310
Fax: (919) 677-0082
e-mail:

Field Service Manager: Pete Shelley
Address: I. Kruger, Inc.
401 Harrison Oaks Blvd.
Suite 100
Cary, NC 27513

Phone: (919) 677-8310
Fax: (919) 677-0082
Cell: (919) 522-2506
e-mail: pete.shelley@veoliawater.com

6. Requests for Additional Services

Requests for additional services or services required beyond those stated in our Contract Agreement with the Contractor shall be billed at Kruger's published standard rates. Such additional services may be necessary due to improperly installed equipment, prolonged construction time, or failure to properly coordinate inspection, start-up and training services.

7. Checklist Forms

Attached are the following forms:

Contractor Pre-Operational Checkout Checklist (Form CPO - 4)
Contractor Functional (Process) Start-Up Checklist (Form CFS - 4)

Both forms need to be completed and sent to the Project Manager prior to any Kruger personnel traveling to the project site.

In addition, the Discfilter Installation Checklist is also attached.

Krüger
I. KRUGER INC.
401 HARRISON OAKS BLVD, STE 100
CARY, NC 27513
TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

Hydrotech Filter Contractor Pre-Operational Check Out Checklist

Project Name:

Project Number:

Contractor Name:

Name of Person Completing This Form:

Title:

ITEMS TO BE COMPLETED BEFORE PRE-OPERATIONAL CHECKOUT

- ☐ Contractor shall confirm all mechanical equipment is installed, refer to Installation Manuals.
- ☐ Contractor shall confirm that all control panels are installed.
- ☐ Contractor shall confirm all wires have been pulled and all control panel terminations are complete.
- ☐ Contractor shall confirm all instruments are installed and wires terminated.
- ☐ Contractor shall confirm all piping is complete.
- ☐ Contractor shall confirm all equipment lubricated and greased, refer to Operation & Maintenance Manual.
- ☐ Contractor shall confirm permanent power to all the equipment.
- ☐ Contractor to confirm Electrical Contractor on site and available.

_____ _____

Contractor Signature Date

VEOLIA Water Systems

Krüger
I. KRUGER INC.
401 HARRISON OAKS BLVD, STE 100
CARY, NC 27513
TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

Hydrotech Filter Contractor Functional (Process) Start-Up Checklist

Project Name:

Project Number:

Contractor Name:

Name of Person Completing This Form:

Title:

ITEMS TO BE COMPLETED BEFORE FUNCTIONAL (PROCESS) START-UP

- ☐ Complete and safe access to the Hydrotech filter system is required prior to start-up. Stairs, platforms, handrails, and grating must be completed prior to start-up.
- ☐ **Contractor shall remove all debris and flush all pipe lines to and from the filter units prior to filling units with water**.
- ☐ Contractor shall confirm that influent water pumping or distribution systems are capable of supplying clarified secondary effluent to the Hydrotech filter at a minimum flow rate equal to one fourth of design flow of one unit for a period of one 8-hour day. For example, if one Hydrotech filter is designed for 4 MGD, Kruger personnel need a continuous flow rate of 1 MGD for one 8-hour day.
- ☐ Contractor shall confirm that systems downstream of the Hydrotech filter are ready to accept water from the filter at a minimum flow rate equal to one fourth of design flow of one filter unit for a period of one 8-hour day.
- ☐ Contractor shall confirm that backwash discharge/disposal systems are ready to accept backwash discharge from the Hydrotech filter.
- ☐ Contractor shall confirm that all deficiencies noted on the attached Kruger checklist(s) have been resolved.

_____ _____

Contractor Signature Date

VEOLIA Water Systems

Krüger

Kruger, Inc.
401 Harrison Oaks Boulevard - Suite. 100
Cary, NC 27513

TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

Discfilter Installation Check List

- ❑ Discfilters with tank (Type 1F) may be lifted by a forklift or by using a crane and straps. Refer to Operation and Maintenance (O&M) manual
- ❑ Discfilters without tank (Type 2F) may be lifted by a forklift or by using a crane utilizing straps to avoid damaging exposed discs. Refer to Operation and Maintenance (O&M) manual
- ❑ Insure that Covers are mounted on Discfilter. It is necessary to protect the filter from direct sunlight with outdoor installations as the heat and UV-radiation may otherwise damage the filter elements.
- ❑ The Discfilter must be properly leveled. Check and adjust the level of the tank for proper flow at both length and width direction. See installation instructions in O&M. Correct level as necessary.
- ❑ Check security/tighten anchor bolting. Specify anchor size used and Torque _____.
- ❑ Install a Tank drain valve and piping for tank units or a pump sump for channel-installed units so that the clean water reservoir can be emptied for maintenance.
- ❑ For discfilters without tank (Type 2F), insure the flow opening in the concrete channel wall is at the correct elevation with the SS inlet box.
- ❑ Discfilters without tank (Type 2F) require installation of a gasket/gasket material between the SS inlet channel and concrete wall. The use of corking only as a gasket is not acceptable.
- ❑ During installation of the SS inlet box on Type 2F discfilters (without tanks), inject silicon corking into the lower corners of the inlet box where the gaskets intersects to prevent short circuiting of inlet water
- ❑ Install and check influent piping to discfilter (type 1F discfilters).
- ❑ Install and check Discfilter backwash piping. Backwash piping must have a 1% or greater slope on any pipe section.
- ❑ Install and check effluent piping from Discfilter.
- ❑ Mount Control Panel and make terminations.
- ❑ Install backwash pump on Discfilter, connect piping flanges and hard wire to control panel. Reference O&M Manual.

VEOLIA WATER
Solutions & Technologies

Revised November 19, 2002

Krüger

Kruger, Inc.
401 Harrison Oaks Boulevard - Suite. 100
Cary, NC 27513

TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

- ❑ Wire the service power (in accordance with O&M) to Discfilter control panel. Check power supply.
- ❑ Type 2F filtered water basins; clean basin(s) of all construction debris and dirt.
- ❑ Check the settings of Drum/Disc drive motor protectors against amperage readings on the motors. Tank must be filled with potable or reclaimed water. See Data plate.
- ❑ Check rotation of Drum/Disc drive motor. Rotation indicated on drive motor cover. Turn switch to "manual mode" to operate unit.
- ❑ Check the settings of backwash pump motor protectors against amperage readings on the motors. Tank must be filled with potable or reclaimed water. See Data plate.
- ❑ Check Rotation of backwash pump. Rotation indicated on motor cover. Turn switch to "manual mode" to operate unit.

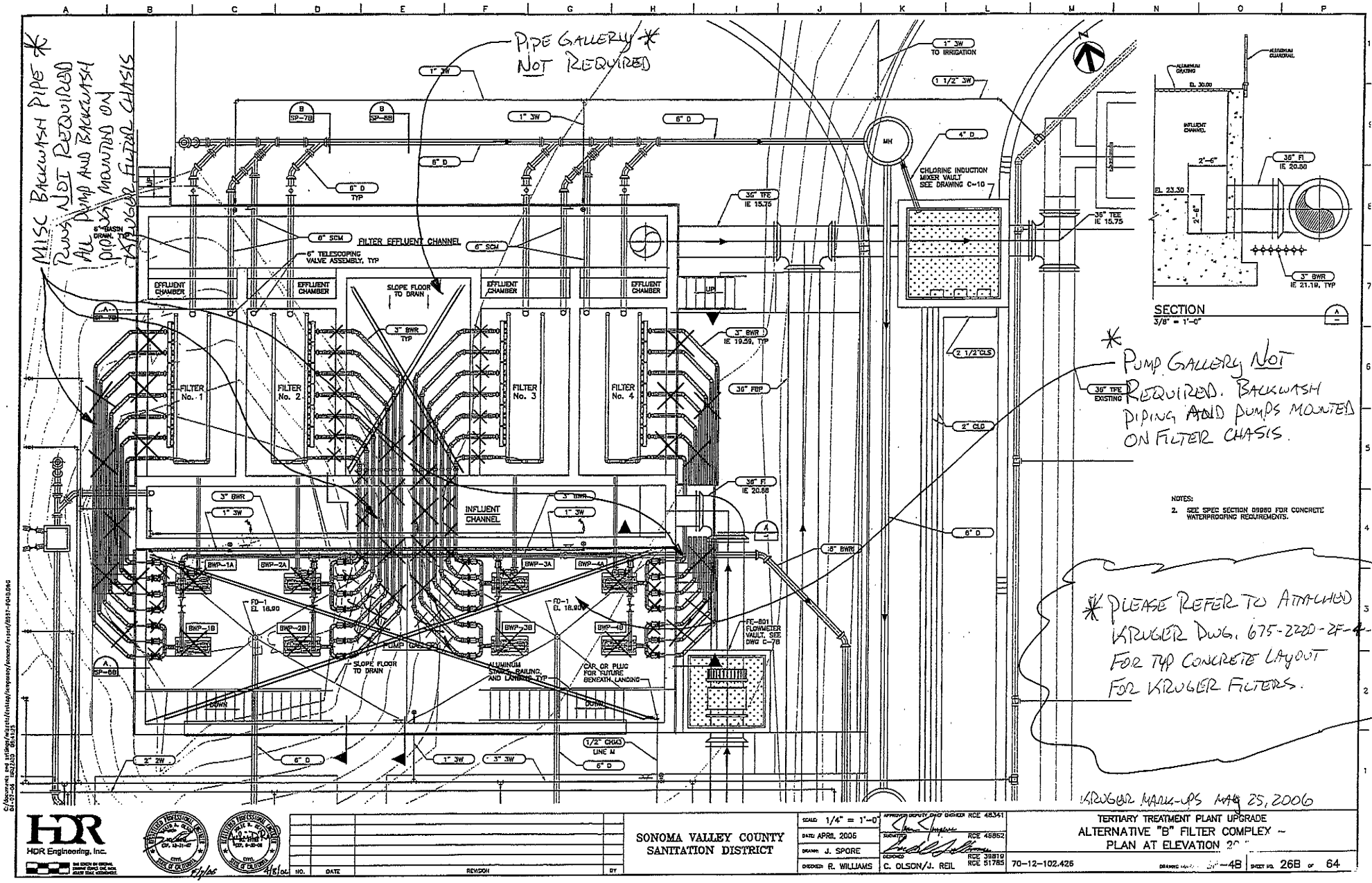
Contractor/Owner Certification that items were completed according to specifications:

Print
Name:_____

Signature:_____Date:_____

—

G. EQUIPMENT VARIATION DETAILS



HDR Engineering, Inc.

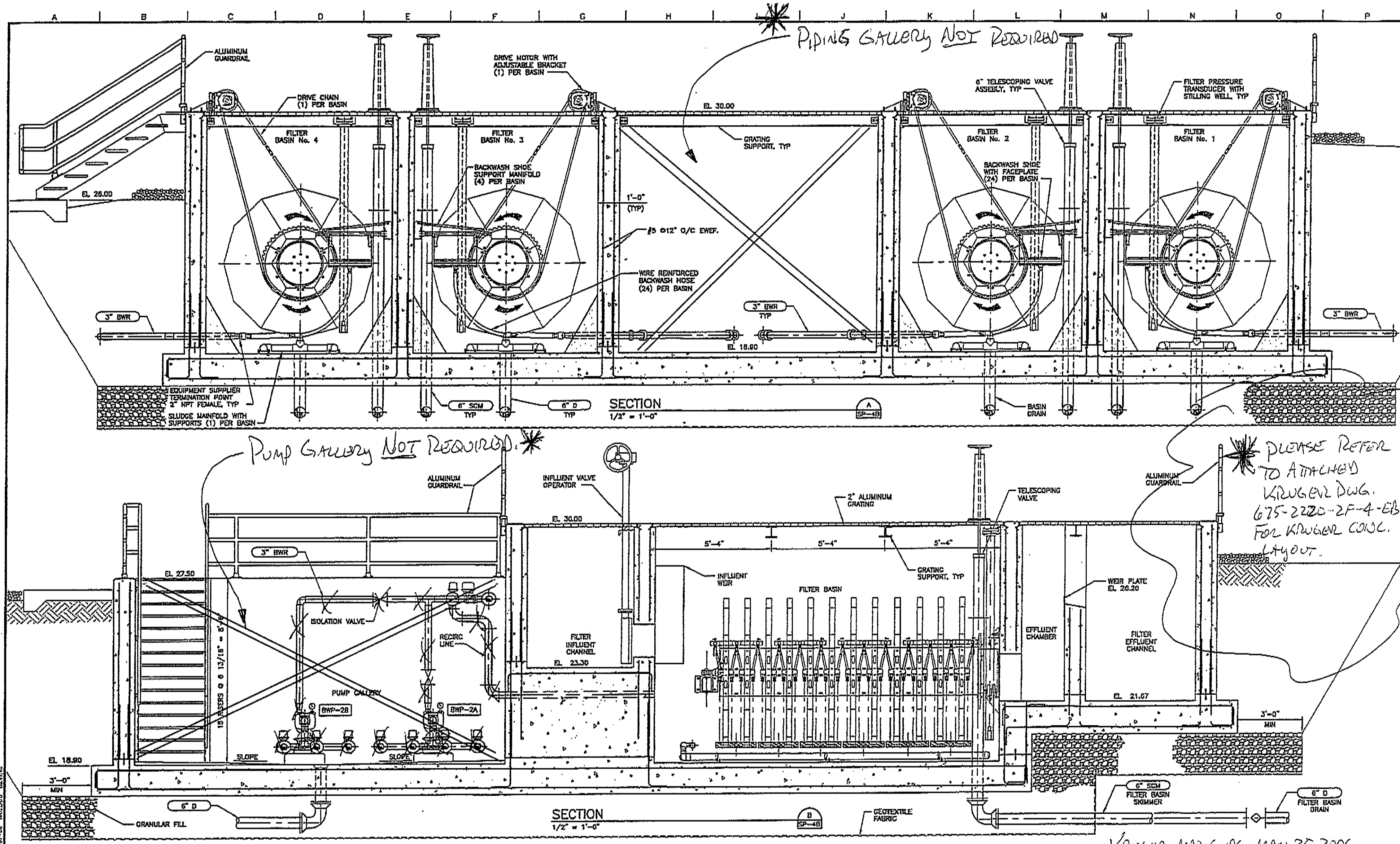
NO.	DATE	REVISION	BY

SONOMA VALLEY COUNTY SANITATION DISTRICT

SCALE	1/4" = 1'-0"
DATE	APRIL 2006
DRAWN	J. SPORE
CHECKED	R. WILLIAMS
APPROVED DEPUTY DIR/ CHECKER	RCE 48341
SUBMITTED	RCE 46862
DESIGNED	C. OLSON/J. REIL RCE 39819 RCE 51785

TERTIARY TREATMENT PLANT UPGRADE
ALTERNATIVE "B" FILTER COMPLEX – PLAN AT ELEVATION 2[illegible]

70-12-102.426 | DRAWING NO. [illegible]-4B | SHEET NO. 26B OF 64



HDR
HDR Engineering, Inc.

NO.	DATE	REVISION	BY

SONOMA VALLEY COUNTY SANITATION DISTRICT

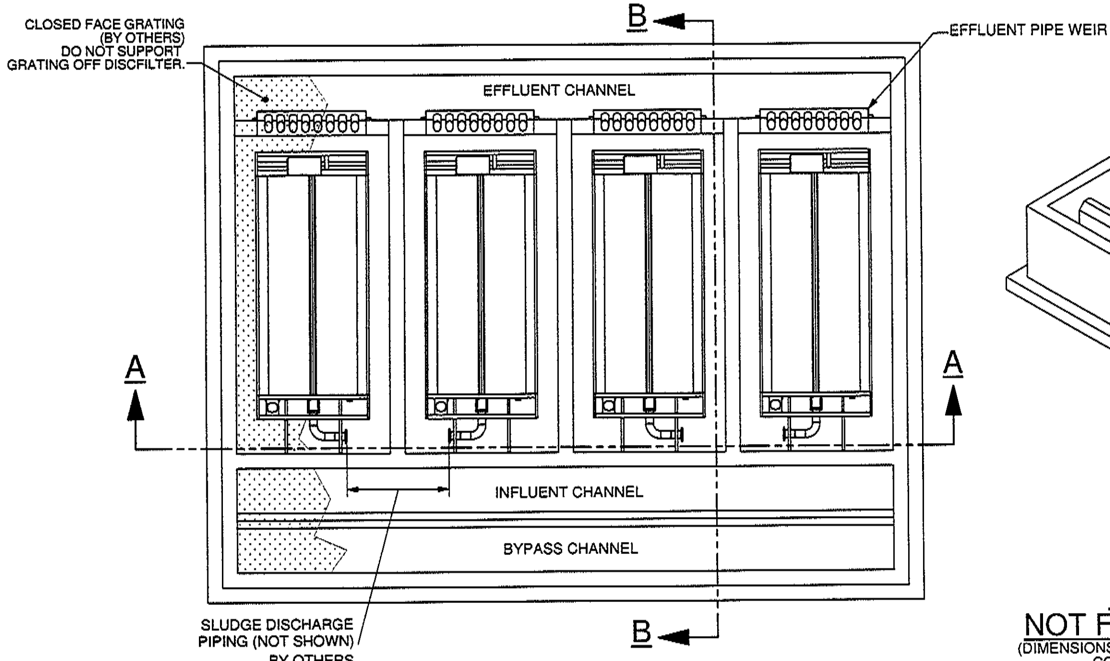
SCALE:	AS NOTED
DATE:	APRIL 2008
DRAWN:	J.SPORE
CHECKED:	R. WILLIAMS

APPROVED: COUNTY CHIEF ENGINEER RCE 48341
SUBMITTED: RCE 46662
DESIGNED: RCE 39819 RCE 51785
C. OLSON/J. REIL

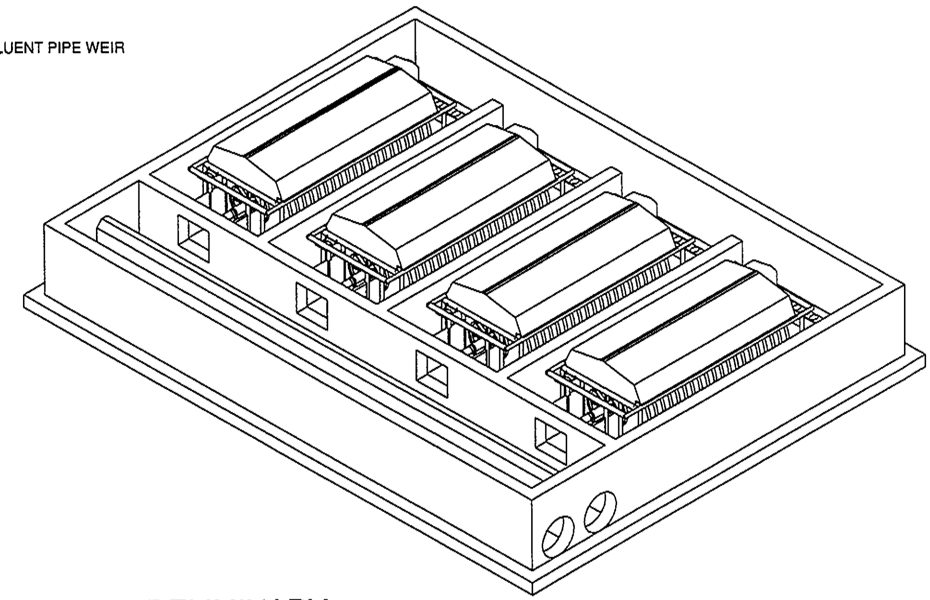
TERTIARY TREATMENT PLANT UPGRADE
ALTERNATIVE "B" FILTER COMPLEX – SECTIONS AND DETAILS I

70-12-102.429

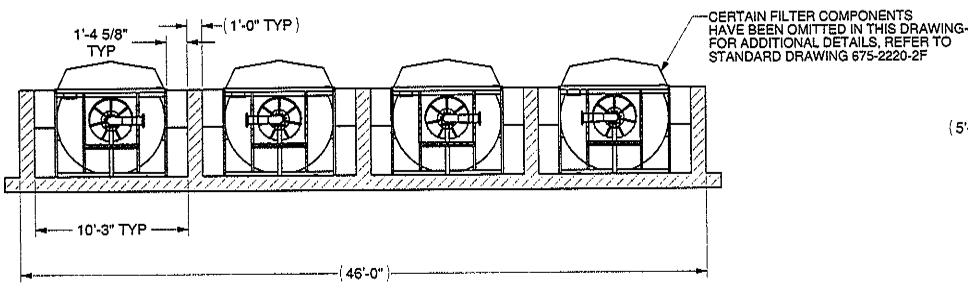
DRAWING NUMBER SP-7B | SHEET NO. 29B OF 64



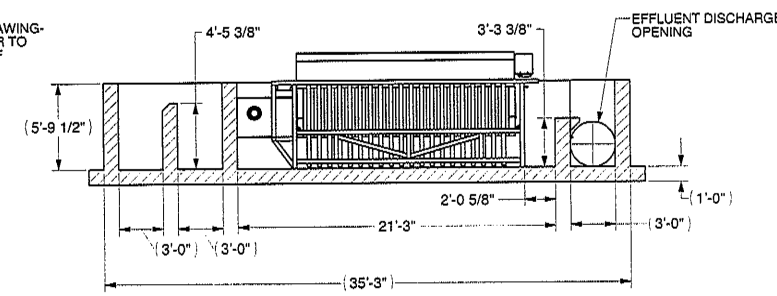
PLAN VIEW



PRELIMINARY-
NOT FOR CONSTRUCTION
(DIMENSIONS) SUBJECT TO CHANGE BASED ON FINAL CONCRETE DESIGN (BY OTHERS)



SECTION A-A
SCALE 1 : 48



SECTION B-B
SCALE 1 : 48

CONCRETE VOLUMES (APPROX.)
1843 CU. FT. (68 CU. YDS) BASED ON 12" THK WALLS & EXCLUDING FLOOR SLAB,

3608 CU. FT. (134 CU. YDS) APPROX. BASED ON 12" THK WALLS & INCLUDING 12" THK FLOOR SLAB

ALL CONCRETE SUPPLIED BY OTHERS

INTERNAL REF NO:

THE PRESENCE OF A PROFESSIONAL ENGINEERS SEAL ON THIS DRAWING INDICATES THAT A SIGNED AND SEALED ORIGINAL IS ON FILE.

rev	date	description	dwn	chk	appv
0	05.16.06	PRELIMINARY RELEASE	CDP	DSD	

COMPANY CONFIDENTIAL

DESIGNER	DATE
CDP	05.16.06
CHECKER DSD	05.16.06
ENGINEER	
MANAGER	
FILE:	
SCALE:	1:36

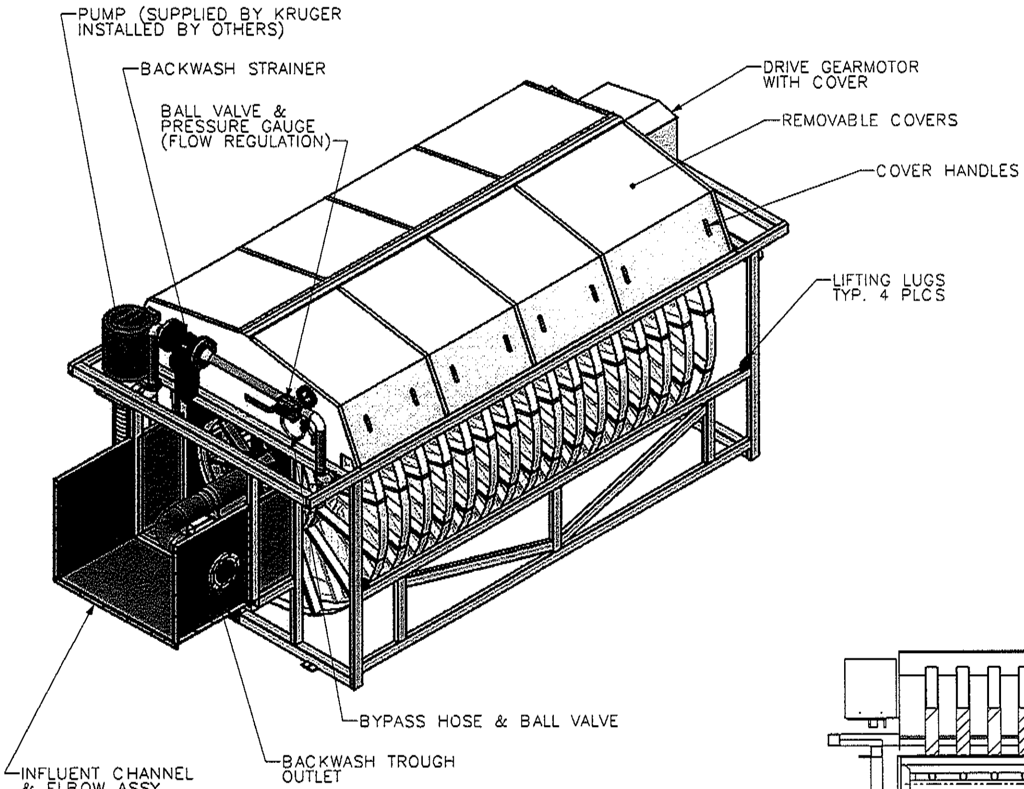
TITLE: DISCFILTER
4 UNITS w/EXTERNAL BYPASS CHANNEL
GENERAL LAYOUT

CLIENT: STANDARD

Krüger
KRUGER, INC.
401 HARRISON OAKS BLVD CARY, NC 27513
(919) 677-8310 FAX (919) 677-0082

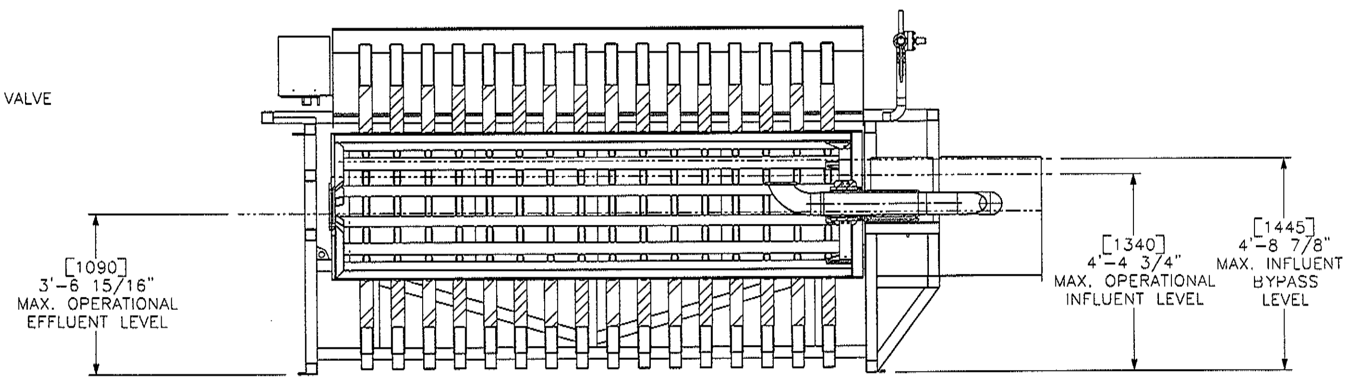
CLASSIFICATION	PROJECT No.	DRAWING	SHEET	REV
	.	675-2220-2F-4-EB	1 OF 1	0

Plotted: Tuesday, May 16, 2006 File Name: M:\Hydrotech\Standard Layouts-2200-2F\2220\4 UNITS\2220-2F-(4 units, external bypass)



ISOMETRIC VIEW

NOTES:
1. QUANTITY OF FILTER DISKS=16, (448 FILTER PANELS MODEL 2216)
15, (420 FILTER PANELS MODEL 2216/15)
2. APPROXIMATE UNIT WEIGHT=6473 LBS (2937 KG)
3. APPROXIMATE WEIGHT REMOVABLE COVER=35 LBS (15.9 KG)
4. BACKWASH PUMP:
GRUNDFOS P/N CRK16-160/6, 15 HP, 3PH/60Hz/460V (MODELS 2216 AND 2216/15)
5. DRIVE MOTOR: 1.5HP, 3PH/60Hz/460V (MODELS 2216 AND 2216/15)
6. LEVEL SENSOR: 24 V
7. BACKWASH TROUGH FLANGE: 6", 125# ANSI B16.5 LAP JOINT FLANGE
8. DRUM & FRAME: 304S.S.(STD.), 316LS.S. (OPTIONAL)
COVERS: ALUMINUM (STD.), 316LS.S. (OPTIONAL)
9. UNITS CAN BE MIRRORED (LEFT HAND BACKWASH HEADER) TO SIMPLIFY MAINTENANCE.
10. GRATING SUPPORT SEPARATE FROM DISCFILTERS AND DESIGNED BY OTHERS.
DO NOT SUPPORT PLATFORMS OR OTHER LOAD BEARING MEMBERS FROM DISCFILTERS.
11. DIMENSIONS IN [] ARE IN mm.



INTERNAL HYDRAULIC PROFILE

THE PRESENCE OF A PROFESSIONAL ENGINEERS SEAL ON THIS DRAWING INDICATES THAT A SIGNED AND SEALED ORIGINAL IS ON FILE.

rev	date	description	dwn	chk	appv
0	07.18.05	PRELIMINARY RELEASE	DSD	CDP	

GRAPHICAL SCALE 0 0.5 1 2 3 6

COMPANY CONFIDENTIAL

DESIGNER	DATE
DSD	07.18.05
CHECKER CDP	07.22.05
ENGINEER BBS	07.26.05
MANAGER	DATE
FILE:	
SCALE:	1:16

TITLE: 2216-2F/2216/15-2F, STANDARD DISCFILTER RIGHT HAND BACKWASH HEADER EXTERNAL BYPASS INFLUENT BOX

CLIENT: STANDARD

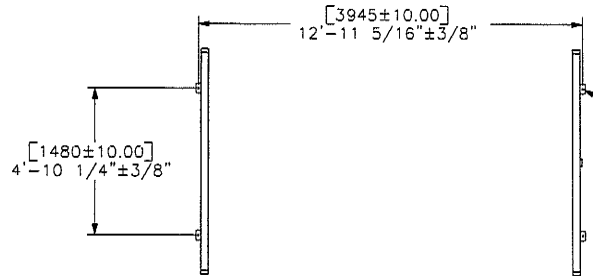
Krüger — KRUGER, INC. 401 HARRISON OAKS BLVD CARY, NC 27513 (919) 677-8310 FAX (919) 677-0082

CLASSIFICATION	PROJECT No.	DRAWING	SHEET	REV
675	.	2216-2F-RH	1 OF 2	0

INTERNAL REF NO:

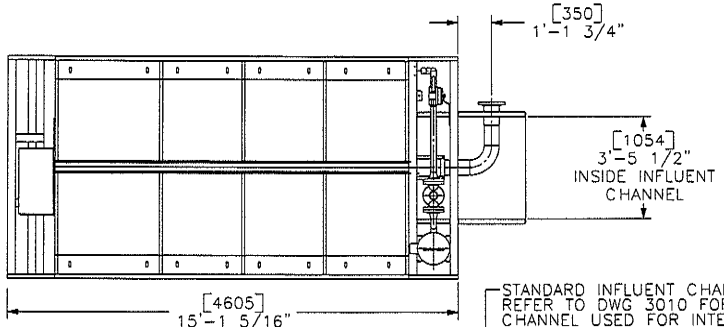
IF BAR IS NOT 1", ADJUST SCALE ACCORDINGLY

Plotted: Tuesday, August 02, 2005 File Name: M:\Hydrotech\2200 Series\1\2216-2F\2991-2216-2F



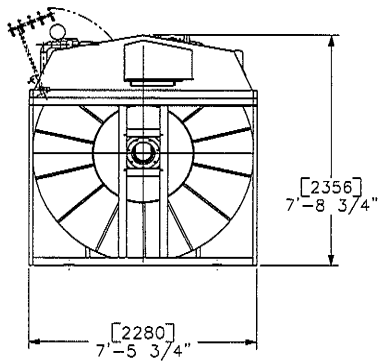
[16] Ø5/8" TYP. 4 PLCS. DO NOT USE CAST IN PLACE ANCHORS–ANCHOR HOLES SHALL BE MATCH DRILLED AFTER FILTER IS IN FINAL LOCATION–REF. STD. ANCHORING DETAIL

SECTION A–A

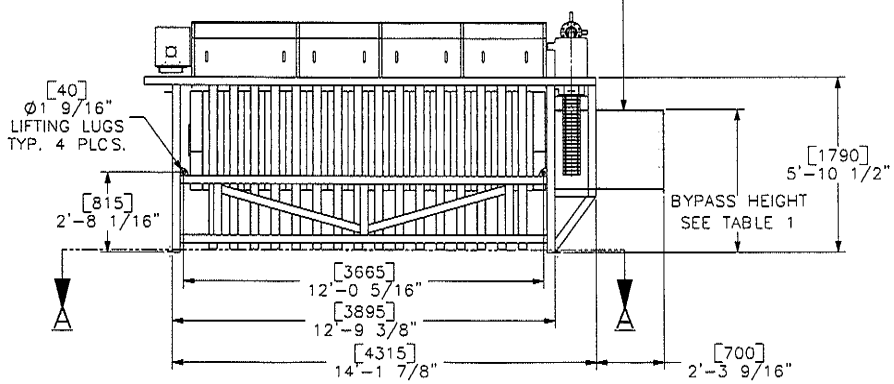


TOP VIEW

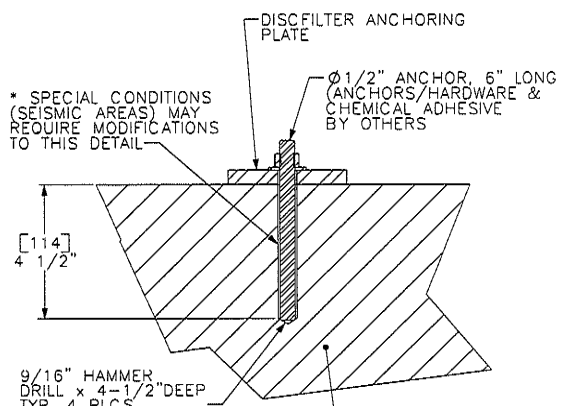
STANDARD INFLUENT CHANNEL SHOWN, REFER TO DWG 3010 FOR OPTIONAL CHANNEL USED FOR INTERNAL BYPASS APPLICATIONS.



END VIEW

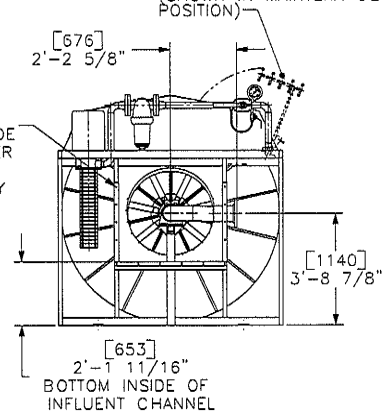


SIDE VIEW



STD. ANCHORING DETAIL
SCALE 1 : 2

[13] Ø1/2", 14 PLCS. BOX TO BE MATCH DRILLED TO CONCRETE AFTER FILTER IS LOCATED. CAULK OUTSIDE PERIMETER OF BOX AFTER BOX IS ANCHORED TO THE WALL (ANCHORS BY OTHERS)



FRONT VIEW

TABLE 1	
INFLUENT CHANNEL TYPE	BYPASS HT. (mm)
STD. U–SHAPED (EXTERNAL BYPASS)	1460
U–SHAPED (INTERNAL BYPASS)	1355
TYPE 1 / TYPE 2 (INTERNAL BYPASS)	1355

THE PRESENCE OF A PROFESSIONAL ENGINEERS SEAL ON THIS DRAWING INDICATES THAT A SIGNED AND SEALED ORIGINAL IS ON FILE.

rev	date	description	dwn	chk	appv
0	07.18.05	PRELIMINARY RELEASE	DSD	CDP	

GRAPHICAL SCALE 0 0.5 1 2 3 6

INTERNAL REF NO:

IF BAR IS NOT 1", ADJUST SCALE ACCORDINGLY

		DATE
DESIGNER	DSD	07.18.05
CHECKER	CDP	07.22.05
ENGINEER	BBS	07.26.05
MANAGER		DATE
FILE:		
SCALE:	1:24	

TITLE: 2216-2F/2216/15-2F, STANDARD DISCFILTER RIGHT HAND BACKWASH HEADER EXTERNAL BYPASS INFLUENT BOX

CLIENT: STANDARD

Krüger
KRUGER, INC.
401 HARRISON OAKS BLVD, CARY, NC 27513
(919) 677-8310 FAX (919) 677-0062

CLASSIFICATION	PROJECT No.	DRAWING	SHEET	REV
675	-	2216-2F-RH	2 OF 2	0

Plotted: Tuesday, August 02, 2005 File Name: M:\Hydrotech\2200 Series\v11\2216-2F\2951-2216-2F

KRUGER HYDROTECH DISCFILTER EQUIPMENT MAINTENANCE ESTIMATES

Discfilter Maintenance Estimates: Referenced equipment includes Discfilter units with backwash pump systems

Equipment	Preventive Maintenance requirement	Maintenance Interval	Persons required to perform task	Time required to perform task per unit	Comments
Disc Filter Unit	"Walk By" Inspection	Daily	1	5 min	Walk-by inspection Includes weekly visual inspection of discs and cleaning level sensor, clean/replace clogged nozzles as needed
Motor	Grease Bearings	Every 2 weeks	1	15 min	Expected lifespan of Drive Motor is 10 years
Drive	Check Oil	Every 6 months	1	15 min	
Disc and Drum Seals	Check Seals	Every 6 months	1	2 hours	Drain the filtered water tank and inspect the drum seal and disc seals at the location of attachment to the drum for leakage
Bearings	Inspect Bearings	Every 6 months	1	15 min	Shaft bearing thickness should be at least 3 mm
Bearings	Replace Bearings	Every 10 years	1	4 hours	Typical service life is about 10 years
Nozzles	Check Nozzles for Deterioration and Wear	Annually	1	30 min	Consider replacing every 2 years based on findings
Drive	Change Oil in Gear Box	Every 10,000 hours	1	60 min	Includes the time required for used oil drum handling
Drive Chain	Replace Drive Chain	Every 20 yrs	2	4 hours	Typical service life is about 20 years
Drive Chain	Check Tension and Inspect for Wear	Every 6 months	1	5 mins	
Discs	Replace Filter Panels	~5-10% media replacement every 5-8 yrs unless torn	1	Approx 1 to 1.5 hrs per disc	Typical service life is 5 to 8 years unless torn or physically damaged.
Lip Seals on Drums	Replace Lip Seals	Every 5 years	1	2 hours per unit	Typical service life is 5 years depending on actual filter loading which influences backwash run-time
Backwash Pumps	Replace Seals	Every 5 to 10 years	1	4 hours	Typical service life is 5 to 10 years depending on actual filter loading which influences backwash run-time at design flow

Krüger *Hydrotech Discfilter*

Discfilter Technology Comparison Table

Tertiary Applications

	Hydrotech	***AquaDisk***
Disc Submergence	Partial (55-65%)	Complete
Flow Pattern	Inside out	Outside in
Media	Woven cloth	Non-woven pile
Filtration	10 or 20 micron absolute	10-20 micron average
Acceptable loading rates	5-6.5 gpm/ft^2	5-6.5 gpm/ft^2
California Title 22 Approved?	Yes	Yes
Max capacity for a single unit	6.7 mgd	5.5 mgd
Footprint for 7.5 mgd peak flow installation	280 ft^2	430 ft^2
Biological fouling of media?	No- Thorough cleaning of media during each backwash	Possible- solids build up can occur over time
Head loss	12" max	12" max
Backwash flow	Counter-current spray	Counter-current vacuum and/or co-current spray
Backwash usage	2-3%	2-8%
Settled solids removal required?	No- Not required, because of inside out flow, all solids are removed during backwash	Yes
Standard material of construction	Stainless steel	Painted steel
Mechanical components	One drive motor and one backwash pump	Multiple valves, backwash pump and sludge removal pump/system
Controls	Simple (Relay Based)	Complex (PLC Based)
Supplied with covers?	Yes	Adder when requested
Maintenance	Simple (All O&M components in dry environment)	Complicated

4. Available Repair and Replacement Services

Kruger has strategically placed repair and installation personnel across the US, including the state of California.

Kruger also stocks a full line of warranty and replacement parts for the filtration product line in the Cary, North Carolina facility.

Krüger

I. Kruger Inc.
401 Harrison Oaks Boulevard - Suite 100
Cary, NC 27513

TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

May 31, 2006

Dale Roberts, P.E.
Sonoma Valley County Sanitation District
P.O. Box 11628
Santa Rosa, CA 95406-1628

Re: Sonoma Valley County Sanitation District Substitution Request – Kruger Supplemental Information

Dear Mr. Roberts:

Per our telephone conversation, this letter provides the supplemental data requested along with further clarification on a few items. The supplemental data and clarifications are as follows:

1. Please provide current contact information for five references.

Kruger Response: We apologize for providing old telephone numbers in the reference list. The updated phone numbers and contacts are as follows:

Project Name	Contact	Phone
Moncks Corner (Bard), SC	John White	843-568-0960
Hastings WWTP, FL	Joey Lundquist	904-692-1520
Baldwin CDBG WWTP, FL	Don Carey	904-266-5033
Eagle Ridge, FL	Scott Stewart	407-869-1919
Carey Station, GA	Bob Sheldon	770-480-5802
Oconee Crossings WTP - Greensboro, GA	Bob Sheldon	770-480-5802
Palatka WWTP	Platt Drew	386-329-0146
Village of Marissa WTF - Marissa, IL	William Yates	618-781-4295
Marburg (Winder), GA	Leslie Harbin	770-867-4334
City of Mesquite, NV	Bill Tanner	702-346-5237
Alamogordo WWTP, NM	Cheryl Richardson	505-439-1606
N.E. Brunswick County, NC	Michael Painter	910-279-5249

2. Please provide DHS Title 22 acceptance letter and provide clarification on the loading rates.

Kruger Response: The DHS letter has been attached. The following also provides an updated table with the design criteria for the project.

I. Kruger Inc.
401 Harrison Oaks Boulevard - Suite 100
Cary, NC 27513

TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

Hydrotech Discfilter Project Design Table

Peak Flow Rate:	16 MGD (11,120 gpm)
Number of Discfilter units:	4 (3 duty, 1 standby)
Discfilter Model:	HSF2216-2F
Length, ft	14.16
Width, ft	7.48
Drum:	
Material	SS304
Disc:	
Material	ABS
Filter element:	
Frame material	SS304
Filter media	Woven Polyester
Filter pore size, µm	10
Number of discs installed per unit	16
Total filter area, ft^2	964
Submerged filter area, ft^2	627
Maximum hydraulic Loading Rate, gpm/ft^2 – all filters in service	4.4
Maximum Hydraulic Loading Rate, gpm/ft^2 – one filter out of service	5.9
Drive system:	
Gearbox and motor manufacturer	SEW Eurodrive
Filter motor	1.5 hp, 480V, 3-phase, 60Hz
Back-wash pump:	
Number of pumps	4
Rinse water pump type	Centrifugal - Grundfos
Pump motor	15 hp, 480V, 3-phase, 60Hz
Capacity at 110 psi	106 gpm
Covers:	
Material	Aluminum
Tank:	
Material	Concrete basins (provided by others)

3. Please describe chemical compatibility of the media.

Kruger Response: The woven polyester media described has the following general characteristics provided by the filter media manufacturer:

Biological Resistance: excellent
Alkali Resistance: poor
Resistant to Mineral Acids: good
Resistant to Organic Acids: fair
Resistant to Oxidizing Agent: good
Effect of Organic Solvent: good
U/V Resistance: fair

Please note that these characteristics are intended to guide laboratory use of the specialized fabric/membrane and as such, provide characteristics of the media in response to high molar concentration of the solvents.

I. Kruger Inc.
401 Harrison Oaks Boulevard - Suite 100
Cary, NC 27513

TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

In wastewater practice, with over ten years of experience and hundreds of installations worldwide (over 70 in the US and Canada) Hydrotech Discfilter has established its ability to function in various applications. Kruger has had no issues with the filter media associated with pre-chlorination, coagulation/polymers or other chemical treatment methods.

If you have any other questions or need further clarifications, please do not hesitate to contact me at the number listed below.

Best regards,

Robert Clay
Regional Product Manager
(916) 434-6848 Direct

ENC
cc: Steve Garnick - MISCO
Project File

VEOLIA WATER

State of California—Health and Human Services Agency
Department of Health Services

California Department of Health Services
DIANA M. BONTÁ, R.N., Dr. P.H.
Director

GRAY DAVIS
Governor

October 2, 2003

Mr. Brian Frewerd
U.S. Filter-Kruger Products
401 Harrison Oaks Blvd., Suite 100
Cary, North Carolina 27513

Subject: Use of the U.S. Filter Kruger Product's Hydrotech polyester media filter utilizing the PET filter fabric to comply with California Water Recycling Criteria

Dear Mr. Frewerd:

By letter dated August 21, 2003, Water 3 Engineering, Inc. requested Departmental review of the U.S. Filter Kruger Product's Hydrotech cloth-media disk filter treatment unit utilizing the PET monofilament filter fabric as an acceptable filtration technology for compliance with the State of California Water Recycling Criteria (Title 22). Accompanying this request was a supplemental report entitled "Evaluation of Hydrotech Filter For Compliance With Title 22 For Recycled water Applications", dated August 2003, which outlined performance evaluation findings using the Hydrotech Filter. The filtration performance data outlined in the report indicates the filter's ability to reliably meet the turbidity performance requirements outlined in Title 22 utilizing the PET monofilament 10-micron filter fabric as the filter medium.

Based on a review of the materials submitted, the Department conditionally accepts the use of the U.S. Filter Kruger Product's Hydrotech Filter as a filtration technology for use in compliance with the California Water Recycling Criteria, subject to the following special provisions:

1. Loading rates shall not exceed 6 gpm/ft^2.

2. Turbidity in the filtered water shall not exceed an average of 2 NTU within a 24-hour period, 5 NTU more than 5 percent of the time within a 24-hour period, and 10 NTU at any time.

3. Acceptance of this technology is contingent on it being complimented with a disinfection process which is compliant with Section 60301.230 (Title 22).

4. Acceptance is for the filter fabric specified as "PET, monofilament, 2:2 twill weave, 11 micron (+/-2.0) mesh opening, 523.2 (n/inch) mesh count, 60-micron thickness, weight rating of 1.48 oz./sq.yd with a stabilized finish" which was assessed in the report noted above. Other cloth materials and fabrication will require additional demonstration studies prior to individual acceptance by the Department.

5. Pretreatment processes should be designed and operated to ensure that the turbidity of the influent to the CMDF does not exceed 10 NTU more than five-percent of the time within a 24-hour period and never exceeds 15 NTU.

6. Individual operations plans shall provide for assurances that adequate backwash duration is practiced to ensure solids removal 'in' and 'on' the filter fabric media.

7. Individual operations plans shall include scheduled inspections and assessments of the cloth condition as an operational safeguard. This should include a routine visual inspection at least monthly, and a more in-depth assessment of the cloth condition at least annually. Inspection frequencies may change as media condition and performance experience is gained with time.

Any proposed changes made in the manufacturing practices that may result in a change in the physical attributes or character of this filter shall be reviewed in advance by the Department to

determine whether the modifications will require additional testing.

The Department will continue to review all proposed water recycling projects on a case-by-case basis to ensure full compliance with all applicable treatment and reliability features required by the Water Recycling Criteria. This will include the collective review of all treatment unit processes, operational controls (e.g. loading rates, backwash/rinse rates, frequency of backwash/rinse, 'O&M' procedures, etc).

If you have any questions concerning this letter, please contact the undersigned at (805) 566-9767.

Sincerely,

Jeffrey L. Stone, Chief
Recycled Water Unit
Division of Drinking Water
and Environmental Management

cc: Water 3 Engineering, Inc. - Scott Goldman
Recycled Water Committee

Alt.Techlisting#5/USfilterhydrotech.DOC